APPENDIX A:

Technical Report of Existing Environmental Conditions

Technical Report of Existing Environmental Conditions

in support of the
U.S. 40 Corridor Study

MP 21 in Wasatch County to MP 157 in Uintah County, Utah

Utah Department of Transportation

Project No. S-0040(65)16

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Tables

Figures

1.0 Introduction

This report was prepared in support of the U.S. Highway 40 (U.S. 40) Corridor Study. The purpose of this report is to help UDOT and the public understand the existing environmental conditions along the highway corridor between Mile Post (MP) 21, near Heber City, Utah, and MP 157 near Jensen, Utah. The information presented in this report will be used to identify and evaluate potential environmental issues that could affect the Utah Department of Transportation's (UDOT's) ability to construct roadway improvements along the corridor. The presence of significant environmental constraints will be an important consideration as UDOT develops a plan for future actions along U.S. 40.

1.1 Sources of Information

The information included in this report came from many sources. Data were gathered by reviewing existing information such as the land-use plans of cities and counties along the corridor; federal agency management plans or other planning documents; digital data available from federal agencies (for example, data on soils and hazardous waste sites), communication with local, state, and federal agency representatives; and an in-field reconnaissance ("windshield survey" or field review). All persons contacted and data sources used are listed in Section 9.0, References, of this report.

1.2 Report Study Area

The U.S. 40 study area includes 136 miles of highway in three Utah counties: Wasatch, Duchesne, and Uintah.[1] This report focuses on regional conditions, though corridor-specific information is provided if it was available.

For the purpose of producing this report, the project area was divided into eight segments based on general land use types (see Figure 1-1. below). These segments are described in detail beginning on page 5.

[1] The word Uintah is spelled two different ways, depending upon the reference. Most spellings use *Uintah*, though Wasatch County and the U.S. Forest Service use the spelling *Uinta*, and the river by that name is the *Uinta* River.

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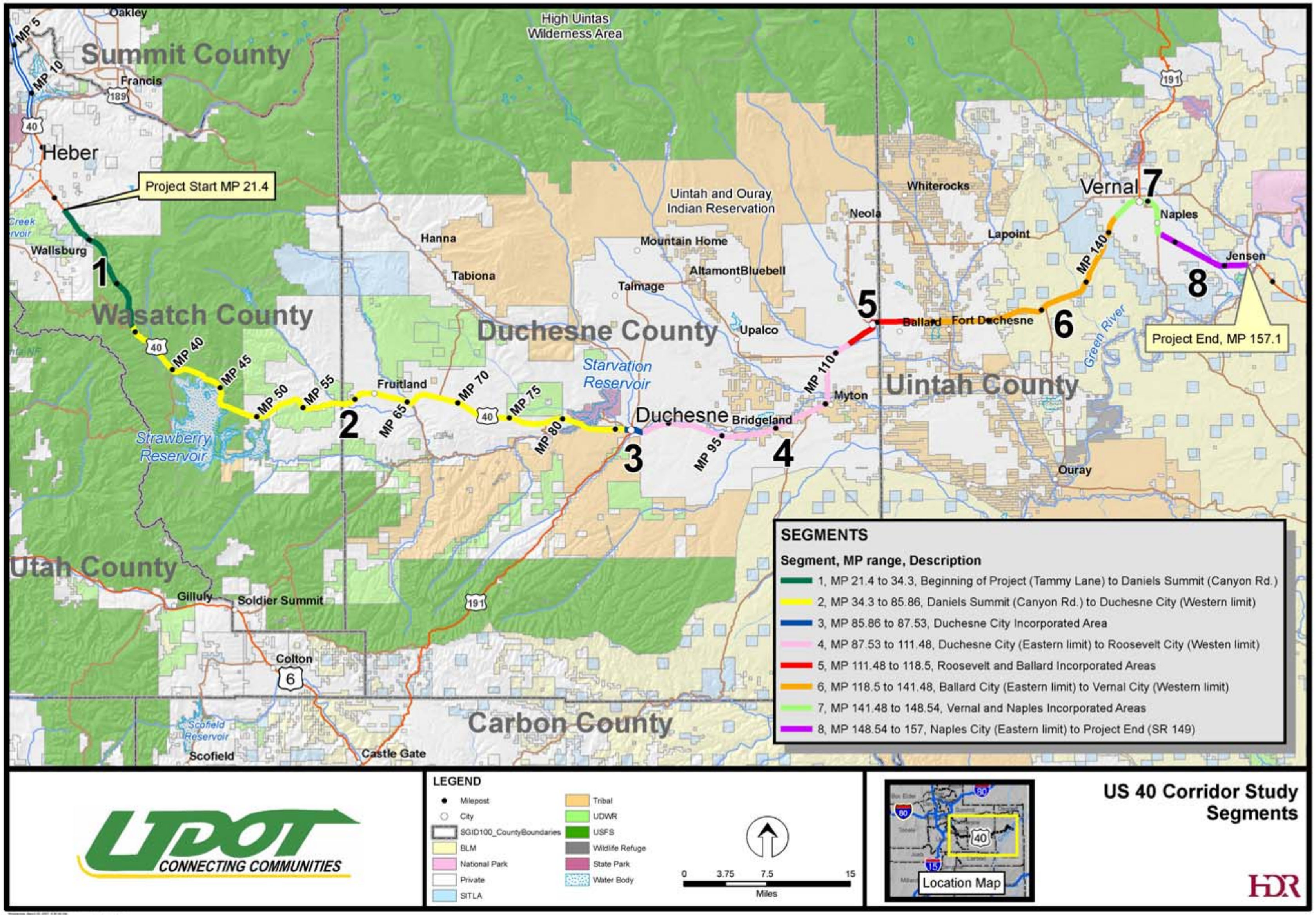
Figure 1-1. Project Area and Project Segments



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Segment 1: Project Start (MP 21) to Daniels Summit (MP 34). This 13-mile-long segment passes through mostly undeveloped land in Wasatch County. Most land along the roadway is managed by the U.S. Forest Service (USFS).

Segment 2: Daniels Summit (MP 34) to the Western Duchesne City Limit (MP 86). This segment, which is 52 miles long, passes through mostly undeveloped land in Wasatch and Duchesne Counties. Most land between Daniels Summit and Strawberry Reservoir is managed by USFS, though there is some private recreational development around the reservoir. Between the eastern side of the reservoir and western Duchesne County, the corridor passes through state-owned land (wildlife management areas) and private land. Most of the land between the Wasatch County–Duchesne County line and the city of Duchesne is privately owned, with the exception of land around Starvation Reservoir, which is managed as a state park.

Segment 3: Incorporated Area of Duchesne City (MPs 86 to 88). This 2-mile-long segment in Duchesne County consists of that portion of the corridor within the Duchesne city limits. Development is typical of that found in rural towns. The land along the highway is dedicated primarily to commercial uses, though there is some residential and industrial development.

Segment 4: Eastern Limit of Duchesne (MP 88) to the Western Limit of Roosevelt (MP 112). This 24-mile-long segment covers an area dominated by private and tribal land. This area supports some agricultural production and limited oil and gas development. The segment is entirely within Duchesne County.

Segment 5: Roosevelt and Ballard Incorporated Areas (MPs 112 to 119). This segment, which is 7 miles long, encompasses the area within the incorporated limits of the cities of Roosevelt and Ballard. The Duchesne County–Uintah County line marks the political division between Roosevelt and Ballard, but the area functions as a single, more urbanized area. Development along U.S. 40 is dominated by commercial uses, though there is some residential development interspersed along the segment.

Segment 6: Eastern Limit of Ballard (MP 119) to the Western Limit of Vernal (MP 142). This 23-mile-long segment is characterized by tribal land and private land in the western half and by state-owned land and land administered by the Bureau of Land Management (BLM) in the eastern half. There is some oil-and-gas-related development along the highway, though most wells are south of U.S. 40 on tribal and BLM-administered land. This segment is entirely within Uintah County.

Segment 7: Vernal and Naples Incorporated Areas (MPs 142 to 149). This 7-mile-long segment is dominated by urban development normally associated with rural cities. Development immediately adjacent to the highway is characterized by commercial and industrial development, with limited residential development interspersed throughout.

Segment 8: Eastern Limit of Naples (MP 149) to Project End (MP 157). This segment, which is 8 miles long, is mostly under private ownership and is characterized by rural residential and agricultural development. State-owned land that touches the highway just west of Jensen supports some oil and gas wells.

1.3 Document Organization

This technical report is organized by resource topic. Each of the following sections summarizes the topic without extensive amounts of detail. This report addresses the following topics:

- Geology and Soils
- Hydrology and Water Resources
- Biological Resources
- Cultural Resources
- Section 4(f) Resources
- Hazardous Materials

2.0 Geology and Soils

2.1 Geology and Topography

2.1.1 Geology

In general, the geologic formations along U.S. 40 are relatively simple. The highway starts at the edge of the Round Valley near Heber City and travels over Daniels Summit to and through the Uintah Basin to the end of the project near Jensen. This section explains the basic geologic structure of the corridor throughout the project area and is derived from the Utah Geological Survey geologic map and hazards database (Hintze 1974; UGS 2007).

The project corridor starts in a transition area of rock that dates from the older Mississippian Period (in and around Heber City) to younger Quaternary rock (in the mountains between Heber City and Strawberry Valley). The transition area is defined in part by a portion of the poorly understood late Quaternary Round Valley fault system, which consists of northwest- to east-trending normal faults bounding the northeastern and southwestern margins of Round Valley. Round Valley is one of several “back valleys” of the Wasatch, a line of discontinuous valleys in the Wasatch Hinterlands east of the Wasatch Range. This fault has no sense of movement, and the most recent paleoevent probably occurred in the middle and late Quaternary period, based on range-front morphology.

Moving east from Segment 1 to Segment 2, the geology transitions from Quaternary to older Tertiary in the Strawberry Valley. This area is defined by the Strawberry Fault system, which consists of poorly understood suspected Quaternary formations. The faults, which are expressed as prominent lineaments and escarpments in bedrock, are east-west-trending normal faults and show no sense of movement. Photogeologic mapping indicates that no scarps are present on late Quaternary deposits. This evidence, together with a fault orientation that appears to be at odds with the contemporary tectonic stress regime, indicates that the fault system should not be considered a potential source for large-magnitude earthquakes. The most recent paleoevent probably occurred in the Quaternary period, based on escarpment morphology and the presence of lineaments.

Once the corridor enters the Strawberry Valley, it is in the Uintah Basin. The basin is a large, elongate, bowl-shaped structure south of the Uintah Mountains; the geology of the basin is dominated by Eocene rock and younger alluvium and colluvium formed during the Tertiary period. The structural axis of the Uintah Basin trends east-west and is about 10 miles north of the topographic low (followed by the Duchesne River). The highway corridor follows sections of younger Quaternary rock that are associated with the Duchesne River between the cities of Duchesne and Roosevelt. Quaternary rock also occurs around Vernal and near the eastern terminus near the Green River.

The corridor passes near the southern limit of an additional small fault, the Stinking Springs Fault, east of the Strawberry Fault system but still on the western edge of the basin and north of the highway. This poorly understood north-trending fault has no sense of movement; the most recent movement probably occurred in the late Quaternary period. The Duchesne–Pleasant Valley Fault System, which consists of poorly understood, suspected Quaternary faults, occurs southeast of the city of Duchesne and south of U.S. 40.

Specific areas along U.S. 40 could exhibit instability (such as localized landslides) that is not discussed in this report. Though the geologic conditions along U.S. 40 appear to be generally stable, planning for and construction of individual improvement projects would require more detailed geotechnical investigations.

2.1.2 Topography

The western end of the corridor is bounded by the Wasatch Mountains, which are part of the Rocky Mountain physiographic province. The study corridor starts at about 5,900 feet above mean sea level (MSL) and travels over Daniels Summit, which reaches about 7,900 feet above MSL before the roadway drops to the Strawberry Valley and the western edge of the Uintah Basin. The center of the basin generally ranges between 5,000 feet and 5,500 feet above MSL (U.S. Army Corps of Engineers Topographic and Engineering Center 2006). East of Strawberry Reservoir, elevations continue to decline and level out at about 5,500 feet above MSL near Duchesne. The elevation of the corridor generally stays between about 5,100 feet and 5,300 feet above MSL between Duchesne and Vernal. East of Vernal, the elevation drops to about 4,700 feet to the Green River.

The Uintah Basin is the northernmost extension of the Colorado Plateau physiographic province. The topography of the project corridor is influenced by two main elements: the Duchesne River south and roughly parallel to the corridor between Strawberry Reservoir and the city of Myton, and the Green River, which is perpendicular to the eastern end of the corridor near Jensen.

2.2 Soils

Soil surveys from the Natural Resource Conservation Service (NRCS) were used to obtain information about the soils along U.S. 40; however, these surveys cover only part of the project corridor. The *Soil Survey of Heber Valley Area, Utah – Parts of Wasatch and Utah Counties* (USDA SCS 1976) contains information about soils between the western terminus of the project and about the top of Daniels Summit (project Segment 1). The *Soil Survey of Uintah Area, Utah – Parts of Daggett, Grand, and Uintah Counties* (NRCS 2003) includes information about soils between the Duchesne County–Uintah County line and the eastern project terminus in Jensen (project Segments 6 through 8).

Land between Daniels Summit and the Duchesne County–Uintah County line was surveyed in the 1920s and 1950s, but reports of the resulting soils data are not available. Projects completed in this area could require supplemental studies (such as geotechnical studies, wetland surveys, or farmland investigations) to determine if special considerations related to soils would be necessary.

Table 2-1 summarizes the available data on soil types along the corridor that are classified as hydric, prime farmland, or farmland of statewide importance. The types, or map units, are generally presented as they occur from west to east. A complete list of soils found along the corridor can be found in Appendix A. Complete List of Mapped Soils within One-Quarter Mile of the Project Corridor. These special-status soils are indicators of conditions that would require special consideration during the planning for future highway improvement projects.

Table 2-1. Special-Status Soils along the Project Corridor

Soil Map Unit Name (Identifier)	Location and Characteristic(s)
Holmes gravelly loam (Hr)	• Along highway low in Daniels Canyon • Farmland of statewide importance
Kovich loam, deep water table variant (Km)	• Along Daniels Creek low in Daniels Canyon • Farmland of statewide importance • Hydric
Clegg loam, 3–6 percent slopes (CgB)	• Along highway and a tributary stream low in Daniels Canyon • Prime farmland if irrigated
Clegg loam, 6–15 percent slopes (CgC)	• Along highway low in Daniels Canyon • Farmland of statewide importance
Fluventic Haploborolls (FA)	• Along highway and Daniels Creek in Daniels Canyon • Hydric

Table 2-1. Special-Status Soils along the Project Corridor

Soil Map Unit Name (Identifier)	Location and Characteristic(s)
Sessions clay loam, 5–15 percent slopes (SEC)	• Along highway in Daniels Canyon • Hydric
Turzo-Umbo complex, 0–4 percent slopes (243)	• Ballard/Fort Duchesne and Vernal/Naples areas of Uintah County • Hydric • Prime farmland if irrigated
Stygee clay loam, 0–1 percent slopes (221)	• Ballard area, western Uintah County and east of Fort Duchesne • Prime farmland if irrigated
Umbo silty clay loam, 0–2 percent slopes (252)	• Ballard area, western Uintah County • Hydric
Ohtog-Parohtog complex, 0–2 percent slopes (166)	• Scattered locations between Duchesne County–Uintah County line and city of Vernal • Prime farmland if irrigated
Ohtog-Parohtog complex, 2–4 percent slopes (167)	• Ballard area, western Uintah County • Prime farmland if irrigated
Shotnick-Walkup complex, 0–2 percent slopes (209)	• Ballard area, western Uintah County and east of Fort Duchesne • Prime farmland if irrigated
Greybull-Utaline-Badland complex, 8–50 percent slopes (94)	• Ballard and Naples/Jensen areas of Uintah County • Hydric
Blackston loam, 0–2 percent slopes (23)	• Fort Duchesne and Naples/Jensen areas of Uintah County • Prime farmland if irrigated
Boreham loam, 0–2 percent slopes (27)	• Fort Duchesne area, western Uintah County; Vernal/Naples area of Uintah County • Prime farmland if irrigated
Blackston loam, 2–4 percent slopes (24)	• Fort Duchesne and Naples areas of Uintah County • Prime farmland if irrigated
Nakoy loamy fine sand, 1–5 percent slopes (160)	• Fort Duchesne area, western Uintah County • Prime farmland if irrigated
Robido-Uver complex, 1–4 percent slopes (192)	• Along Uinta River near Fort Duchesne • Hydric
Yarts fine sandy loam, 2–4 percent slopes (280)	• Along sand washes between Fort Duchesne and Vernal • Prime farmland if irrigated
Turzo-Umbo complex, 2–4 percent slopes (244)	• Vernal area of Uintah County • Prime farmland if irrigated
Green River loam, 0–2 percent slopes, rarely flooded (89)	• Vernal/Naples area of Uintah County • Hydric

Table 2-1. Special-Status Soils along the Project Corridor

Soil Map Unit Name (Identifier)	Location and Characteristic(s)
Shotnick sandy loam, 2–4 percent slopes (206)	• Vernal/Naples area of Uintah County • Prime farmland if irrigated
Nolava-Nolava, wet complex, 0–2 percent slopes (162)	• Vernal/Naples/Jensen area of Uintah County • Prime farmland if irrigated
Nolava-Nolava, wet complex, 2–4 percent slopes (163)	• Vernal/Naples/Jensen area of Uintah County • Prime farmland if irrigated
Umbo clay loam, 0–2 percent slopes (251)	• Vernal/Naples/Jensen area of Uintah County • Hydric
Wyasket loam, 0–2 percent slopes (275)	• Naples/Jensen area of Uintah County • Hydric
Wyasket loam, 2–4 percent slopes (276)	• Naples/Jensen area of Uintah County • Hydric

Source: NRCS 2007

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3.0 Hydrology and Water Resources

3.1 Hydrology

3.1.1 Surface Water

U.S. 40 crosses a total of 149 non-wetland water features along the 147-mile project corridor. The features consist of 80 intermittent streams, rivers, or washes; 33 perennial streams or rivers; 36 canals, ditches, or aqueducts; and the arm of one reservoir (Starvation Reservoir). These features, many of which are unnamed, are tributaries of two major systems: the Utah Lake system (USGS cataloging unit 16020201) on the west side of Daniels Summit and the Lower Green-Diamond system (USGS cataloging unit 1406001) on the east side of Daniels Summit (that is, the Uintah Basin). See Appendix B. Rivers and Streams Crossed by U.S. 40 in the Project Corridor for a complete list of features crossed by U.S. 40 in the project area. Wetlands are discussed in Section 4.3.1 of this report.

Water features on the west side of Daniels Summit drain to Utah Lake via the Provo River system. Some water is pumped from Strawberry Reservoir, which naturally drains to the Green River system, to Diamond Fork Creek and ultimately to the Spanish Fork River and Utah Lake. This pumping is part of the Central Utah Project system.

Major Green River/Uintah Basin tributaries along the corridor include the Strawberry, Duchesne, and Uinta Rivers. The Utah State Water Plan – Uintah Basin Plan (Utah Division of Water Resources 1999) describes minimum in-stream flows for these river systems. The maintenance of minimum flows is important for maintaining healthy aquatic ecosystems and regional quality of life. By far, the largest use of surface water resources in the Uintah Basin is for agricultural production (Utah Division of Water Resources 1999).

Water Quality

Surface water resources provide a number of beneficial uses to communities along U.S. 40. These beneficial-use categories include public water supply, recreation, agriculture, and fish and wildlife protection and propagation. Consistent with Section 303(d) of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) assesses and monitors the quality of the nation's surface water resources to ensure that water resources are being managed in a way that protects beneficial uses. EPA oversees the monitoring and documentation of water bodies that it has identified as "impaired" by pollutants with the intent of improving water quality (that is, removing the impairment). The State of Utah also defines beneficial uses for many water bodies and assesses and monitors water bodies that are impaired with respect to their beneficial uses.

About 27% of the rivers and streams in Utah that have assigned beneficial uses, and 31% of the ponds, lakes, and reservoirs in Utah that have assigned beneficial uses, are identified as impaired under Section 303(d) of the Clean Water Act. Table 3-1 lists the impaired water bodies that have been inventoried and that occur along or cross the U.S. 40 corridor.

Table 3-1. Impaired Water Bodies along U.S. 40

Water Body	Location	Impairment	County
Segment 1			
None	–	–	–
Segment 2			
Strawberry Reservoir	Strawberry Valley	Organic enrichment, low dissolved oxygen	Wasatch
Starvation Reservoir	Just west of Duchesne	Organic enrichment, low dissolved oxygen	Duchesne
Segment 3			
None	–	–	–
Segment 4			
Antelope Creek	Near Bridgeland	Salinity, total dissolved solids (TDS), chlorides	Duchesne
Duchesne River	Near Myton	Salinity, TDS, chlorides	Duchesne
Segment 5			
Dry Gulch Creek and tributaries	Near Roosevelt	Salinity, TDS, chlorides	Duchesne
Segment 6			
Dry Gulch Creek and tributaries	Near Ballard and Fort Duchesne	Salinity, TDS, chlorides	Uintah
Uinta River	Near Fort Duchesne	Salinity, TDS, chlorides; habitat alterations	Uintah
Segment 7			
None	–	–	–
Segment 8			
Ashley Creek	Between Naples and Jensen	Salinity, TDS, chlorides; metals	Uintah

Source: EPA 2004

There are a number of potential pollution sources along the U.S. 40 corridor. These include but are not limited to agricultural activities, mining, and urban runoff. Any roadway improvements in the vicinity of impaired water bodies would need to be carefully designed to ensure that they would not further degrade the quality of any impaired water body. For example, modifications to roadway drainage near a water body that is listed as impaired by organic enrichment would need to be designed so that the new system would not increase the amount of organic material transported to the water body.

Floodplains

Floodplains are land areas adjacent to rivers and streams that are at risk of periodic flooding. Flood insurance rate maps (FIRMs) produced by the Federal Emergency Management Agency (FEMA) define the federally regulated boundaries of floodplains along rivers and streams. The FIRMs are part of FEMA's regulating authority under the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Some state and local governments also conduct mapping, but typically local jurisdictions rely on floodplain information provided by FEMA.

Not all rivers and streams have been mapped by FEMA. For the U.S. 40 corridor, FEMA has produced FIRMs for most areas of Wasatch and Uintah Counties and for the cities of Duchesne and Myton in Duchesne County. The FIRMs do not provide floodplain information for tribal land or for USFS land.

Table 3-2 below lists the FEMA Zone A floodplains that occur along or that cross U.S. 40 within the study area. Zone A floodplains are those areas that are likely to be inundated by a 100-year flood (one that has a 1% chance of occurring in any given year).

Table 3-2. Zone A Floodplains along U.S. 40

River or Creek	Approximate Milepost(s)	County
Segment 1		
Daniels Creek	21–26 (USFS boundary)	Wasatch
Segment 2		
Strawberry River	36.5	Wasatch
Co-Op Creek	40–41	Wasatch
Cow Creek	45	Wasatch
Soldier Creek	50.5	Wasatch
Deep Creek	57–59[a]	Wasatch
Currant Creek	58–59[a]	Wasatch
Segment 3 [b]		
Duchesne River	87	Duchesne
Segment 4		
Duchesne River	105	Duchesne
Segment 5		
None	–	–
Segment 6		
Montes Creek	119	Uintah
Uinta River	122	Uintah
Sand Wash	130	Uintah
Halfway Hollow Creek	131	Uintah
Twelvemile Wash	134–138	Uintah
Segment 7		
Steinaker Service Canal	143	Uintah
Ashley Central Canal	143	Uintah
Ashley Canal	147	Uintah
Segment 8		
Tributary to Ashley Creek	149	Uintah
Tributary to Ashley Creek	151	Uintah
Tributary to Ashley Creek	154	Uintah
Ashley Creek	154	Uintah

Sources: FEMA 1977, 1983, 1988a, 1988b

[a] Mapped to Wasatch County–Duchesne County line only.

[b] FEMA has not mapped Starvation Reservoir, which crosses U.S. 40 at about MP 82.

Any roadway projects in the vicinity of mapped floodplains would need to be designed so that the floodplain is not altered in a way that would adversely affect the capacity of the river or stream, significantly alter floodplain hydraulics, or result in other adverse downstream impacts.

3.1.2 Groundwater

Groundwater hydrology has been extensively studied in the Uintah Basin. EPA describes the groundwater hydrology as controlled primarily by the region's geologic structure, with permeability variations resulting from differences of lithology and facies (rocks distinguished from others by appearance or composition) as well as widespread faulting and fracturing of the rocks (EPA 2004).

Most of the project area overlies the Uinta-Animas Aquifer, a unit of the greater Colorado Basin Aquifer system. The Uinta-Animas Aquifer is further divided into three sub-basins: the Uinta Basin, the Piceance Basin, and the San Juan Basin. The project area overlies the Uinta Basin sub-basin.

According to Robson and Banta (1995):

> Ground-water recharge to the Uinta-Animas aquifer generally occurs in the areas of higher altitude along the margins of each basin. Ground water is discharged mainly to streams, springs, and by transpiration from vegetation growing along stream valleys.
>
> In the Uinta Basin, the part of the aquifer in the Duchesne River and Uinta Formations has about 200,000 acre-feet per year of recharge. The rate of ground-water withdrawal is small, and natural discharge is approximately equal to recharge.
>
> Dissolved-solids concentrations in water in the Uinta-Animas aquifer in the Uinta Basin generally range from 500 to 3,000 milligrams per liter; concentrations can exceed 10,000 milligrams per liter in some of the deeper parts of the Uinta Formation. Smaller dissolved-solids concentrations are prevalent near recharge areas where the water usually is a calcium or magnesium bicarbonate type. Larger dissolved-solids concentrations are more common near discharge areas where the water generally is a sodium bicarbonate or sulfate type.

Groundwater recharge is divided between infiltration of precipitation (95.2%), infiltration of irrigation water (3.2%), and return flow from wells and springs (1.6%). About 80% of the groundwater recharge in the Uintah Basin takes place in the basin's northern half, primarily because more water, particularly in the form of precipitation, is available to enhance the recharge in the Uinta Mountains than what is available to the much lower upland areas at the southern edge of the basin (Utah Division of Water Resources 1999). U.S. 40's location in the center of the Uintah Basin and out of the Uinta Mountains places it in an area that probably contributes to some groundwater recharge (especially in irrigated areas) but not a substantial amount.

4.0 Biological Resources

4.1 General Description of Existing Conditions

The project corridor passes through a number of habitat types. Vegetation along Segment 1, which travels through Daniels Canyon, includes by sagebrush/grass, mountain brush, aspen, Douglas fir, lodgepole pine, white fir, spruce/fir, and forb (non-grass) communities. Big-game species that inhabit the area include elk, moose, black bear, cougar, and mule deer. Small mammals include cottontail rabbit and snowshoe hare. Two species of forest grouse use the area, and the federally listed whooping crane migrates through the area (USFS 2001).

The remainder of the corridor (Segments 2 through 8) passes through the center of the Uintah Basin. Major vegetation types in this basin include pinyon-juniper woodland, salt desert scrub, desert shrub, agriculture, and disturbed habitats.

The Uintah Basin is dominated by wildlife species typical of high, cold deserts. Mammals include white-tailed prairie dog, black-tailed jackrabbit, coyote, beaver, red fox, porcupine, spotted skunk, and Townsend’s big-eared bat (USFS 1994). It is year-round range for deer and antelope and winter range for elk. Birds include waterfowl, wintering bald eagles, and an introduced population of Rio Grande turkeys along the Green River and its associated wetlands. Sandhill cranes and an occasional whooping crane are present during migration. The Green and Duchense Rivers are important corridors for many neotropical migratory birds. The dominant desert shrub habitat is used by burrowing owls, short-eared owls, ferruginous hawks, sage sparrows, lark sparrows, western meadowlarks, loggerhead shrikes, horned larks, and occasional irruptions (sudden population increases) of lark buntings. Golden eagles nest throughout the region. Reptiles that inhabit the Uintah Basin include the faded pygmy rattlesnake, striped whipsnake, and Woodhouse’s toad.

4.2 Available Information

State and federally maintained species lists often provide a starting point for identifying special-status species that might be present in a project area. Additionally, existing resource survey data also provide information about sensitive resources and habitats that might be present in a project area. Much of the U.S. 40 project area has recently been surveyed for biological resources by USFS and BLM. The following sections summarize the existing, readily available information about the U.S. 40 corridor.

Species Lists

There are a total of 58 species listed by the federal or state governments as threatened, endangered, or sensitive in Wasatch, Duchesne, and Uintah Counties. This list includes all special-status species known to be present in the entire three-county area and might not reflect the species that are present in the much smaller U.S. 40 project corridor. Of these 58 species, there are 16 birds, 10 fish, 10 mammals, four reptiles and amphibians, one mollusk, and 17 plants (see Appendix C. Federal and State Listed Sensitive Species for Counties along U.S. 40 in the Project Corridor). Forty-one of these 58 species are State of Utah or BLM sensitive species (wildlife species of concern, conservation agreement species, and BLM sensitive plant species), and 17 of these species are listed under the federal Endangered Species Act as threatened or endangered:

- **Birds:** southwestern willow flycatcher, Mexican spotted owl, whooping crane, and yellow-billed cuckoo
- **Fish:** bonytail, Colorado pikeminnow, humpback chub, and razorback sucker
- **Mammals:** black-footed ferret, brown (grizzly) bear, Canada lynx, and gray wolf
- **Plants:** Barneby ridge-cress, clay reed-mustard, shrubby reed-mustard, and Uinta Basin hookless cactus

Recent Documentation

Existing conditions along some of the corridor have been recently documented through the planning processes of USFS and BLM. The information available from these agencies could be used to supplement future project-level analyses for biological resources along U.S. 40.

The Uinta National Forest Plan Final Environmental Impact Statement (USFS 2003) includes information about USFS land between and including Daniels Canyon and Strawberry Reservoir. The document includes information about the following resources:

- Forested vegetation
- Non-forested vegetation
- Aquatics
- Terrestrial wildlife
- Threatened, endangered, and sensitive species

Conditions on BLM-administered land between Roosevelt and the project's eastern terminus are summarized in the draft Environmental Impact Statement (EIS) for the Vernal Resource Management Plan (BLM 2005). According to that document, BLM has the following information about resources in the agency-designated Vernal Planning Area, which includes a portion of the U.S. 40 corridor:

- Preliminary inventory of riparian and wetland resources
- Sensitive species
- Vegetation communities
- Noxious weeds
- Wild horse populations
- Terrestrial wildlife

4.3 Windshield Survey

On March 13 and 14, 2007, HDR biologists conducted a "windshield" (drive-through) survey of the U.S. 40 study area in order to identify (at a coarse level) sensitive resources that could be affected by or have implications on roadway improvement projects along U.S. 40. The findings of this survey are detailed in the Natural Resources Windshield Survey Memo contained in the project files. The following sections summarize the survey results.

4.3.1 Wetlands

The windshield survey did not include formal delineations of wetlands or other waters of the United States. The following assessment is based on observations by a qualified biologist.

Daniels Canyon (MP 24–34) is a narrow riparian canyon whose primary feature is Daniels Creek as it flows west from Daniels Pass. From Daniels Pass east to Strawberry Reservoir (MP 35–45), the area is dominated by the Strawberry River and the wetland complexes associated with this basin. Wetlands are scattered along the highway between Strawberry Reservoir and Duchesne (MPs 45–85); the wetlands observed were at about MPs 50, 60, and 85. Two main stretches of highway west of Duchesne had several wetland complexes: between Antelope Creek and Myton (MPs 96–106) and west of Vernal (MPs 145–155). The area between Antelope Creek and Myton is primarily characterized by wet meadow complexes, saline meadows, and wetlands associated with drainages that cross under the highway. Between Myton and the end of the project (MP 157) near Jensen, the wetlands are primarily emergent marshes and wetlands associated with drainages, with a few small wet meadows.

4.3.2 Use of the Corridor by Deer and Elk

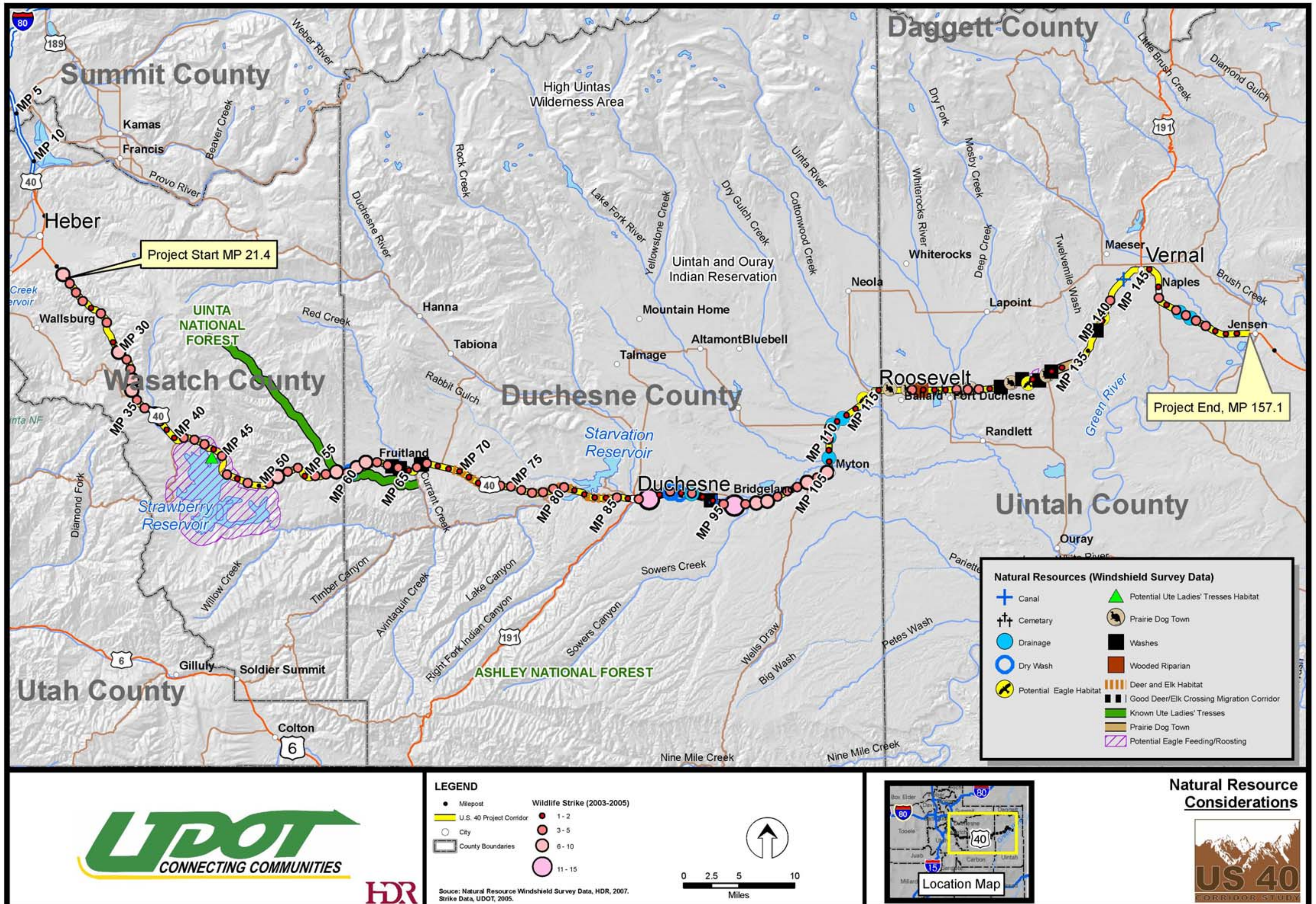
This information was collected via the windshield survey and supplemented using UDOT's 2005 strike data for large mammals.

If the number of wildlife strikes along a given segment of highway is proportional to the number of animals that cross the highway at that segment, then UDOT's 2005 strike data would indicate the numbers of animals that cross U.S. 40 at any given area. Using this assumption, Figure 4-1. Natural Resource Considerations, below shows that wildlife cross U.S. 40 consistently from the beginning of the project (MP 21) through about Roosevelt (MP 115).

The windshield survey found one area that appears to be a frequently used deer and elk migration corridor: between Duchesne and Bridgeland (MPs 86–96). This area is bounded by Indian Canyon to the west, Antelope Creek to the east, and wooded foothills on the south side of the highway. On the north side of the highway are irrigated agricultural fields and the Duchesne River drainage basin. According to UDOT, this area of U.S. 40 has the greatest number of wildlife strikes.

Other areas that are likely frequently crossed by wildlife are the narrow Daniels Canyon (MPs 21–35), the Strawberry Valley (MP 35–55), and around major water crossings such as Currant Creek (MPs 55–60) and Starvation Reservoir (MPs 75–85).

Figure 4-1. Natural Resource Considerations



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4.3.3 Plant and Wildlife Species or Habitats of Concern

The species and habitats of concern that were identified during the windshield survey include raptor nesting or foraging habitat, prairie dog towns (which indicate the possibility of burrowing owls and black-footed ferrets), and known occupied Ute ladies'-tresses habitat.

The area between Roosevelt and near Vernal (MPs 110–140) has numerous active prairie dog towns. Due to the presence of prairie dogs, the associated potential for burrowing owls and black footed-ferrets would need to be investigated to determine the impacts to these species from any U.S. 40 roadway improvement projects.

This same segment of the corridor also has the best cliff habitat for nesting raptors. Most raptors have a one-half-mile range around their nest site. This area might need to be protected from noise and construction impacts if construction occurs during the nesting season. No other habitat for species of concern was observed along the corridor.

A few plant species of concern are known to be present in the Uintah Basin. However, the windshield survey did not find any habitat along the U.S. 40 corridor that met these species' specific soil and elevation requirements. As with any project, county lists of protected species are available, and all species on the relevant lists would need to be addressed during subsequent analyses under the National Environmental Policy Act (NEPA) or consultation processes with the U.S. Fish and Wildlife Service (USFWS).

Ute ladies'-tresses, a terrestrial orchid, is known to occur south of U.S. 40 in the Uintah Basin near Currant Creek. This species is known to grow along the banks of the creek, including near the creek's crossing of U.S. 40. Other drainages that cross U.S. 40 could provide Ute ladies'-tresses habitat, but to date, no plants have been observed near U.S. 40.

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5.0 Cultural Resources

A May 2007 review of recorded cultural resource site records that are filed at the Utah Office of State History found that several cultural resource surveys have been done along the U.S. 40 corridor, but that large stretches have still not been evaluated for cultural resources (previous surveys include Bernard 2000; Billat 2003; Billat and Baker 1989; Crosland 2001, 2002; Hutmacher 2003; Polk 1992; and Polk and Weymouth 1993). An important consideration for future highway improvements in the U.S. 40 corridor study area will be the potential effect on cultural resources. The cultural overview presented in Appendix D. Summary of Cultural Resources along the U.S. 40 Project Corridor provides a context for understanding the types of archaeological and historic sites that could be encountered along the corridor.

The U.S. 40 study area extends across a vast portion of the Uintah Basin that is rich in prehistoric and historic cultural resources. Future improvement projects along the corridor are likely to encounter a variety of prehistoric and historic archaeological sites dating from a broad range of time periods. The Uintah Basin is within the traditional rangelands of several Native American tribes, and traditional cultural properties could also be encountered. In addition, U.S. 40 passes through several small communities (such as Fruitland, Bridgeland, and Myton) and larger towns (such as Duchesne, Roosevelt, and Vernal) where historic commercial buildings and houses can be found close to the highway. Other historic structures include bridges, culverts, irrigation canals, and U.S. 40 itself as the historic Victory Highway, which would also need to be considered during future planning efforts. Detailed information about these prehistoric and historic resources is included in Appendix D. Summary of Cultural Resources along the U.S. 40 Project Corridor.

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6.0 Section 4(f) and Section 6(f) Resources

6.1 Section 4(f) of the U.S. Department of Transportation Act

Section 4(f) of the U.S. Department of Transportation Act of 1966 requires that any actions funded or carried out by agencies of the U.S. Department of Transportation must be evaluated for their potential effects to significant publicly owned public parks, recreation areas, or wildlife and waterfowl refuges and any land from a historic site of national, state, or local significance (49 United States Code [U.S.C.] 303). Because UDOT might complete projects on U.S. 40 in partnership with the Federal Highway Administration (FHWA) and/or the Federal Transit Administration (FTA), the presence of potential Section 4(f) properties is an important factor. Projects without the involvement of FHWA or FTA would not be subject to the provisions of Section 4(f).

The NEPA regulations for FHWA or FTA projects that occur near or could potentially affect any Section 4(f) resource require a detailed Section 4(f) analysis. Table 6-1 lists some of the potential Section 4(f) resources along the corridor. Other resources, such as historic properties, would have to be determined on a case-by-case basis as projects are identified and carried forward into the phase of NEPA that requires environmental documentation.

Table 6-1. Section 4(f) and 6(f) Resources along the Project Corridor

Resource	Owner/Administrator	Address or Location	City/Place	Type of Resource
Wasatch County				
Whiskey Springs Picnic Area	USFS	About MP 25.2	East of Heber City	4(f) only
Dry Canyon trailhead	USFS	About MP 26.4	East of Heber City	4(f) only
Clegg Canyon trailhead	USFS	About MP 27.5	East of Heber City	4(f) only
Center Canyon trailhead	USFS	About MP 30.4	East of Heber City	4(f) only
Lodgepole Campground	USFS	About MP 33.7, west of highway	East of Heber City	4(f) only
Daniels Summit trailhead and recreation access parking area	USFS	About MP 34.4, at Daniels Summit	East of Heber City	4(f) only
Telephone Hollow trailhead and recreation access parking area	USFS	About MP 35.7	East of Heber City	4(f) only

Table 6-1. Section 4(f) and 6(f) Resources along the Project Corridor

Resource	Owner/Administrator	Address or Location	City/Place	Type of Resource
Quarry trailhead and recreation access parking area	USFS	About MP 36.4	East of Heber City	4(f) only
Strawberry River trailhead and recreation access parking area	USFS	About MP 37	East of Heber City	4(f) only
Strawberry visitor center	USFS	About MP 40.3, south of highway	Strawberry Reservoir	4(f) only
Coop Creek trailhead and recreation access parking area	USFS	About MP 41.6, north of highway	Strawberry Reservoir	4(f) only
Chicken Creek east parking and fishing access	USFS	About MP 42.6, south of highway on lake shore	Strawberry Reservoir	4(f) only
Ladders parking and fishing access	USFS	About MP 45.3, west of highway on lake shore	Strawberry Reservoir	4(f) only
Sage Creek day use area	USFS	About MP 47.5, south of highway	Strawberry Reservoir	4(f) only
Soldier Creek trailhead and recreation access parking area	USFS	About MP 50, south of highway on lake shore	Strawberry Reservoir	4(f) only
Duchesne County				
Currant Creek Wildlife Management Area	Utah Division of Wildlife Resources	About MP 58–59	Near Fruitland	4(f) only
Starvation State Park	Utah State Parks	About MP 81	Duchesne	4(f) only
Duchesne Park and Pool Complex	Duchesne City	100 W. Main Street, Duchesne	Duchesne	4(f) and 6(f)
Myton City Park	Myton City	About MP 105	Myton	4(f) and 6(f)
Roosevelt Regional Park	Roosevelt City	About MP 116	Duchesne	4(f) and 6(f)
Uintah County				
Ballard Park	Ballard City/Uintah Recreation District	About MP 116.5, north of highway	Ballard	4(f) only
Cobble Rock Park	Vernal City/Uintah Recreation District	About MP 144.3, south of highway	Vernal	4(f) and possibly 6(f)
Kiwanis Park	Uintah Recreation District	About MP 144.4, north of highway	Vernal	4(f) only

Sources: USFS 2007; DWR 2002; Duchesne County School District 2007; Uintah Recreation District 2007; Uintah County School District 2007

6.2 Section 6(f) of the Land and Water Conservation Fund Act

State and local governments often obtain grants to acquire or make improvements to parks and recreation areas through the federal Land and Water Conservation Fund Act of 1965 (16 U.S.C. Sections 4601-4 through 4601-11, September 3, 1964, as amended). Section 6(f) of the act prohibits the conversion of property acquired or developed with these grants to a non-recreational use without the approval of the U.S. Department of the Interior's National Park Service. Section 6(f) directs the Department of the Interior to ensure that replacement lands of equal (monetary) value, location, and usefulness are provided as conditions to such conversions. Parks that have received funding under Section 6(f) are listed in Table 6-1. Section 4(f) and 6(f) Resources along the Project Corridor above.

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7.0 Hazardous Materials

EPA and the State of Utah maintain several searchable databases of hazardous waste sites. This report includes information from the following databases:

- EPA EnviroFacts databases: RCRAInfo, Superfund National Priorities List, and Brownfields Properties (RCRA is the Resource Conservation and Recovery Act)
- National Response Center: the federal clearinghouse for oil and chemical spill reports; releases to land only
- Utah Division of Environmental Response and Remediation (DERR): leaking underground storage tanks

7.1 Reported Sites and Spills

According to the RCRAInfo database, there are three hazardous waste handlers in Uintah and Duchesne Counties near the project corridor. Table 7-1 summarizes the type and location of these handlers.

Table 7-1. Hazardous Waste Handlers along the Project Corridor

Handler	Type of Material(s)	Address	City	County
GWEC–Bluebell Gas Plant	Crude petroleum and natural gas extraction and natural gas liquid extraction	108 North 200 East (about MP 114.5, southeast of highway)	Roosevelt	Duchesne
Pennzoil Company	Petroleum refinery (permitted large-quantity generators)	West Highway 40 (about MP 117, about 1.5 miles west of the city)	Roosevelt	Duchesne
Dowell Schlumberger Western Water	Support activities for oil and gas operations	1170 E. Main Street (about MP 145.2, east of highway)	Vernal	Uintah

Source: EPA 2007a

This table includes only handlers/generators as reported through RCRAInfo and those identified as large-quantity generators on the EPA handlers list. The table does not include all permitted small-quantity waste generators/handlers, of which there are many along the corridor; that information is available from EPA at www.epa.gov.

The RCRA Corrective Action database includes a listing for the Pennzoil Facility on West Highway 40 in Roosevelt. There are no Superfund or Brownfields sites along the corridor (EPA 2007b).

The federal National Response Center is the clearinghouse for spill reporting nationwide. There are 23 documented spills of hazardous materials to land along the corridor. A detailed list of these spills is provided in Appendix E. National Response Center Spills to Land Listings for the Project Corridor. Future project-level environmental analysis would consider the location, nature, and status of these spills in greater detail.

The Utah DERR compiles information on underground storage tanks. There are numerous records for leaking underground storage tanks along the corridor. The locations of these tanks, as well as those that have been closed, are listed in Appendix F. Leaking Underground Storage Tank Locations along the Project Corridor.

8.0 Summary of Environmental Considerations and Potential Constraints

The information in this report identifies environmental conditions that must be considered when planning for, analyzing, and designing projects along the U.S 40 corridor. In summary, the most noteworthy considerations and constraints are as follows:

- Geology and Soils
    - *Geology.* Localized unstable conditions could occur along U.S. 40, but these conditions are not documented in readily available literature. For this reason, project-specific studies could be required in areas that exhibit instability.
    - *Soils.* Soils that indicate the presence of wetlands and that are used to classify special agricultural soils could require special consideration. The presence of these soils could indicate an area that could be subject to state and/or federal regulation.
- Hydrology and Water Resources
    - *Surface Water Resources.* Project planning and construction must consider potential project-related effects (such as stream alteration) to state and federally regulated streams, rivers, ponds, and lakes along the project corridor.
    - *Water Quality.* Project planning and construction must consider the potential effects on water quality, especially to the eight systems identified as impaired under the Clean Water Act.
    - *Floodplains.* Any construction in or near the mapped or identified 100-year floodplains along the project corridor might need to be evaluated for potential construction-related effects to hydrology.
    - *Groundwater.* Any construction should consider potential water-quality effects resulting from recharge of localized groundwater sources.
- Wetlands
    - If the project is near or will directly affect wetlands and waters of the United States, the project could require permitting under the Clean Water Act.

    - Both the EPA and Federal Highway Administration (FHWA) have a “no net loss” wetland policy. If regulated wetlands are affected and compensatory mitigation is required as a result, UDOT will need to develop and implement a mitigation plan. If the total amount of potential wetland impacts resulting from projects in the U.S. 40 corridor is such that completing required wetland mitigation becomes a challenge, UDOT should consider establishing a wetland mitigation bank in the Uintah Basin. UDOT could work cooperatively with other agencies to establish and operate the bank, which would allow other agencies to use the bank as well.

- Special-Status Species
    - *Construction Considerations.* Before construction of each project, UDOT should consult state and county lists of special status species that could occur near the project and identify any required surveys. If special-status species are found, project planning and construction could require special consideration in order to ensure adequate protection of the species.
    - *Ute Ladies’-Tresses.* Work in the vicinity of known Ute ladies’ - tresses populations or in or near potential habitat would require preconstruction surveys and, potentially, special considerations during project planning and construction.
- Fish and Wildlife
    - *Active Prairie Dog Towns.* Work near, or that would directly affect, prairie dog towns (which can also provide habitat for burrowing owls and black-footed ferrets) would require preconstruction surveys and, potentially, special considerations during project planning and construction.
    - *Nesting Raptors.* Construction areas near active raptor nests might need to be protected against noise and construction impacts during the nesting season.
    - *Deer and Elk.* Projects in areas that are used by deer and elk should be evaluated for potential impacts on habitat connectivity and migration patterns. Planning for projects in areas where deer and elk movement conflicts with highway travel (that is, in areas where wildlife strikes are high) should consider cost-effective means to reduce vehicle and deer/elk collisions.

- Cultural Resources
  - Future improvement projects along the highway corridor are likely to encounter a variety of prehistoric and historic archaeological sites dating from a broad range of time periods. Future planning efforts would also need to consider sites supporting and resources related to the traditional rangelands of Native American tribes and traditional cultural properties; historic commercial buildings and residences; and historic structures such as bridges, culverts, irrigation canals, and U.S. 40 itself as the historic Victory Highway.
- Section 4(f) Resources
  - If future projects have FHWA or FTA involvement, project planning will need to consider effects to Section 4(f) resources.
- Hazardous Materials
  - Planning for projects near known or suspected hazardous materials sites would need to consider effects to or resulting from proximity to the sites.

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10.0 Appendices

Appendix A. Complete List of Mapped Soils within One-Quarter Mile of the Project Corridor

Identifier	Soil Series Name	Notable Characteristics[a]
102	Hideout-Badland-Rock outcrop complex, 2 to 8 percent slopes	
106	Homko loam, 0 to 4 percent slopes	AASHTO A-4
12	Badland-Rock outcrop complex, 1 to 100 percent slopes	
125	Lambsen loam, 1 to 3 percent slopes	AASHTO A-4
131	Lind loam, 0 to 2 percent slopes	AASHTO A-4
132	Lind loam, 2 to 4 percent slopes	AASHTO A-4
137	Mikim loam, 3 to 15 percent slopes	AASHTO A-4
141	Milok fine sandy loam, 3 to 8 percent slopes	AASHTO A-2 or A-4
142	Milok-Montwel-Badland association, 3 to 25 percent slopes	AASHTO A-7-6
144	Montwel clay loam, 4 to 25 percent slopes	AASHTO A-6
145	Montwel very cobbly clay loam, 15 to 50 percent slopes	AASHTO A-2 or A-6
147	Montwel-Hideout complex, 2 to 25 percent slopes	AASHTO A-2 or A-4
148	Montwel-Honlu-Rock outcrop complex, 25 to 90 percent slopes	
160	Nakoy loamy fine sand, 1 to 5 percent slopes	Prime Farmland if Irrigated AASHTO A-2 or A-4
162	Nolava-Nolava, wet complex, 0 to 2 percent slopes	Prime Farmland if Irrigated AASHTO A-4
163	Nolava-Nolava, wet complex, 2 to 4 percent slopes	Prime Farmland if Irrigated AASHTO A-4
164	Nolava loam, 4 to 8 percent slopes	AASHTO A-4
166	Ohtog-Parohtog complex, 0 to 2 percent slopes	Prime Farmland if Irrigated AASHTO A-4 or A-6
167	Ohtog-Parohtog complex, 2 to 4 percent slopes	Prime Farmland if Irrigated AASHTO A-4 or A-6
169	Paradox loam, 3 to 8 percent slopes	AASHTO A-4 or A-6
174	Pariette loam, 2 to 4 percent slopes	AASHTO A-4
176	Parohtog loam, 0 to 2 percent slopes	AASHTO A-4
181	Pits, gravel	AASHTO A-1
182	Pits-Dumps complex	AASHTO A-2 or A-1
184	Polychrome-Paradox association, 8 to 40 percent slopes	AASHTO A-4 or A-6

Identifier	Soil Series Name	Notable Characteristics[a]
188	Riemod loam, 0 to 2 percent slopes	AASHTO A-4
189	Riemod loam, 2 to 4 percent slopes	AASHTO A-4
19	Begay sandy loam, 2 to 15 percent slopes	AASHTO A-2 or A-4
192	Robido-Uver complex, 1 to 4 percent slopes	Hydric AASHTO A-4 or A-1
193	Rock outcrop	
2	Abracon loam, 3 to 8 percent slopes	AASHTO A-4
20	Begay-Hideout-Rock outcrop complex, 2 to 15 percent slopes	
205	Shotnick loamy sand, 0 to 4 percent slopes	AASHTO A-2
206	Shotnick sandy loam, 2 to 4 percent slopes	Prime Farmland if irrigated AASHTO A-2 or A-4
207	Shotnick sandy loam, 4 to 8 percent slopes	AASHTO A-2 or A-4
209	Shotnick-Walkup complex, 0 to 2 percent slopes	Prime Farmland if irrigated AASHTO A-2 or A-4
213	Solirec-Abracon-Begay complex, 2 to 15 percent slopes	AASHTO A-2 or A-4
217	Splimo very cobbly loam, 8 to 25 percent slopes	AASHTO A-2 or A-4
218	Splimo very gravelly loam, 8 to 25 percent slopes, extremely flaggy	AASHTO A-2 or A-4
220	Splimo-Clapper complex, 25 to 50 percent slopes	AASHTO A-2 or A-4
221	Stygee clay loam, 0 to 1 percent slopes	Prime Farmland if irrigated AASHTO A-6
223	Stygee silty clay loam, 0 to 1 percent slopes	AASHTO A-4, A-6, or A-7
224	Sugun clay loam, 0 to 2 percent slopes	AASHTO A-6
225	Sugun sandy loam, 0 to 2 percent slopes	AASHTO A-2 or A-4
226	Sugun sandy loam, 2 to 4 percent slopes	AASHTO A-2 or A-4
23	Blackston loam, 0 to 2 percent slopes	Prime Farmland if irrigated AASHTO A-4
24	Blackston loam, 2 to 4 percent slopes	Prime Farmland if irrigated AASHTO A-4
240	Turzo clay loam, 4 to 8 percent slopes	AASHTO A-6
242	Turzo loam, 0 to 4 percent slopes	AASHTO A-4
243	Turzo-Umbo complex, 0 to 2 percent slopes	Prime Farmland if irrigated Hydric AASHTO A-6
244	Turzo-Umbo complex, 2 to 4 percent slopes	Prime Farmland if irrigated AASHTO A-6
248	Uffens loam, 0 to 3 percent slopes	AASHTO A-4
25	Blackston loam, 4 to 8 percent slopes	AASHTO A-4

Identifier	Soil Series Name	Notable Characteristics[a]
251	Umbo clay loam, 0 to 2 percent slopes	Hydric AASHTO A-6
252	Umbo silty clay loam, 0 to 2 percent slopes	Hydric AASHTO A-4, A-6, or A-7
253	Utaline very gravelly sandy loam, 0 to 2 percent slopes	AASHTO A-1 or A-2
254	Utaline very gravelly sandy loam, 2 to 8 percent slopes	AASHTO A-1 or A-2
255	Utaline very gravelly sandy loam, 8 to 25 percent slopes	AASHTO A-1 or A-2
27	Boreham loam, 0 to 2 percent slopes	Prime Farmland if irrigated AASHTO A-4
275	Wyasket loam, 0 to 2 percent slopes	Hydric AASHTO A-4
276	Wyasket loam, 2 to 4 percent slopes	Hydric AASHTO A-4
277	Wyasket peat, 0 to 2 percent slopes, ponded	AASHTO A-8
28	Braf-Rock outcrop complex, 2 to 15 percent slopes	
280	Yarts fine sandy loam, 2 to 4 percent slopes	Prime Farmland if irrigated AASHTO A-4
285	Water	
43	Clapper complex, 25 to 50 percent slopes	AASHTO A-2 or A-4
44	Clapper gravelly loam, 2 to 25 percent slopes	AASHTO A-4
45	Clapper gravelly loam-Badland-Rock outcrop complex, 25 to 50 percent slopes	
52	Clapper-Montwel complex, 2 to 50 percent slopes	AASHTO A-1, A-1, or A-4
53	Cliff sandy loam, 2 to 4 percent slopes	AASHTO A-2 or A-4
61	Crib loam, 1 to 3 percent slopes	AASHTO A-4
65	Denco silty clay loam, 8 to 25 percent slopes	AASHTO A-4, A-6, or A-7
71	Firstgap loam, 2 to 20 percent slopes	AASHTO A-4
74	Gerst parachannery loam, 4 to 25 percent slopes	AASHTO A-4
77	Gerst-Rock outcrop complex, 4 to 40 percent slopes	
89	Green River loam, 0 to 2 percent slopes, rarely flooded	Hydric AASHTO A-4
91	Greybull clay loam, 4 to 20 percent slopes	AASHTO A-6
93	Greybull loam, 4 to 8 percent slopes	AASHTO A-4
94	Greybull-Utaline-Badland complex, 8 to 50 percent slopes	Hydric AASHTO A-7-6
95	Hanksville silty clay loam, 2 to 25 percent slopes	AASHTO A-6 or A-7
BGE	Bezzant very cobbly loam, 15 to 45 percent slopes	AASHTO A-4
BKF	Bradshaw very cobbly very fine sandy loam, 40 to 60 percent slopes	AASHTO A-1

Identifier	Soil Series Name	Notable Characteristics[a]
BWF	Burgi gravelly loam, 40 to 60 percent slopes	AASHTO A-2 or A-4
CgB	Clegg loam, 3 to 6 percent slopes	Prime Farmland if irrigated AASHTO A-4 or A-6
CgC	Clegg loam, 6 to 15 percent slopes	Farmland of Statewide Importance AASHTO A-4 or A-6
COF	Cluff-Daybell association, very steep	AASHTO A-4 or A-7
CPD	Cluff soils, 15 to 25 percent slopes	AASHTO A-4 or A-7
CPF	Cluff soils, 40 to 60 percent slopes	AASHTO A-4 or A-7
DAF	Daybell-Fitzgerald association, very steep	AASHTO A-2 or A-4
DBF	Daybell soils, 40 to 65 percent slopes	AASHTO A-2 or A-4
DWC	Deer Creek-Watkins Ridge complex, 6 to 15 percent slopes	AASHTO A-6 or A-7
FA	Fluventic Haploborolls	Hydric
GMF	Gappmayer very cobbly fine sandy loam, 40 to 65 percent slopes	AASHTO A-2 or A-4
HeA	Henefer silt loam, 1 to 3 percent slopes	AASHTO A-4
HHF	Henefer-Wallsburg association, very steep	AASHTO A-6
HJC	Henefer soils, 6 to 10 percent slopes	AASHTO A-4 or A-7
Hr	Holmes gravelly loam	Farmland of Statewide Importance AASHTO A-2
Km	Kovich loam, deep water table variant	Farmland of Statewide Importance Hydric AASHTO A-6
RO	Rock land	
RRD	Roundy loam, 15 to 25 percent slopes	High shrink-swell potential 31-48" below surface AASHTO A-4
RRE	Roundy loam, 25 to 40 percent slopes	High shrink-swell potential 31-48" below surface AASHTO A-4
RRF	Roundy loam, 40 to 60 percent slopes	High shrink-swell potential 31-48" below surface AASHTO A-4
RSC	Roundy-Cluff association, moderately steep	AASHTO A-4
RSD	Roundy-Cluff association, hilly	AASHTO A-4
RUF	Roundy-Daybell association, very steep	AASHTO A-4
SEC	Sessions clay loam, 5 to 15 percent slopes	Hydric AASHTO A-6
WBF	Wallsburg-Rock outcrop complex, 20 to 60 percent slopes	

Identifier	Soil Series Name	Notable Characteristics[a]

Sources: USDA and NRCS 2003; USDA SCS 1976

[a] The American Association of State Highway and Transportation Officials (AASHTO) system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

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Appendix B. Rivers and Streams Crossed by U.S. 40 in the Project Corridor

MP	Stream Name	Stream Type
Segment 1		
22.0		Intermittent stream, river, or wash
27.5		Intermittent stream, river, or wash
28.0	Daniels Creek	Perennial stream or river
28.2	Daniels Creek	Perennial stream or river
28.4	Daniels Creek	Perennial stream or river
28.6	Daniels Creek	Perennial stream or river
29.6	Daniels Creek	Perennial stream or river
29.6		Intermittent stream, river, or wash
29.7	Daniels Creek	Perennial stream or river
30.7		Intermittent stream, river, or wash
31.6		Intermittent stream, river, or wash
Segment 2		
36.5	Strawberry River	Perennial stream or river
37.6		Intermittent stream, river, or wash
39.9	Little Co-Op Creek	Perennial stream or river
40.3		Perennial stream or river
40.5	Co-Op Creek	Perennial stream or river
40.8		Intermittent stream, river, or wash
41.3		Perennial stream or river
41.8	Chicken Creek	Perennial stream or river
43.7		Perennial stream or river
44.1	Trout Creek	Perennial stream or river
45.0		Perennial stream or river
45.5		Perennial stream or river
47.1	Sage Creek	Intermittent stream, river, or wash
50.3	Soldier Creek	Perennial stream or river
51.6	Deep Creek	Perennial stream or river
52.6		Intermittent stream, river, or wash
53.9	Deep Creek	Intermittent stream, river, or wash
54.3	Deep Creek	Intermittent stream, river, or wash

MP	Stream Name	Stream Type
54.4	Deep Creek	Intermittent stream, river, or wash
54.4	Deep Creek	Intermittent stream, river, or wash
54.6	Deep Creek	Intermittent stream, river, or wash
54.7	Deep Creek	Intermittent stream, river, or wash
54.9	Deep Creek	Intermittent stream, river, or wash
55.0		Intermittent stream, river, or wash
55.0	Deep Creek	Intermittent stream, river, or wash
55.7	Deep Creek	Intermittent stream, river, or wash
55.8	Deep Creek	Intermittent stream, river, or wash
55.9	Deep Creek	Intermittent stream, river, or wash
56.0	Deep Creek	Perennial stream or river
56.2	Deep Creek	Perennial stream or river
56.3	Deep Creek	Perennial stream or river
57.9	Deep Creek	Perennial stream or river
58.0	Currant Creek	Perennial stream or river
60.0		Intermittent stream, river, or wash
65.0	Red Creek	Perennial stream or river
65.4		Intermittent stream, river, or wash
66.4	Sand Wash	Intermittent stream, river, or wash
68.1		Intermittent stream, river, or wash
68.9		Intermittent stream, river, or wash
69.0		Intermittent stream, river, or wash
71.4		Intermittent stream, river, or wash
71.9		Intermittent stream, river, or wash
72.3		Intermittent stream, river, or wash
73.3		Intermittent stream, river, or wash
76.2		Intermittent stream, river, or wash
80.1		Intermittent stream, river, or wash
81.1	Starvation Reservoir	Reservoir
82.0		Intermittent stream, river, or wash
82.7		Intermittent stream, river, or wash
82.7		Intermittent stream, river, or wash
83.6		Intermittent stream, river, or wash
84.0		Intermittent stream, river, or wash
84.3		Intermittent stream, river, or wash
84.5		Intermittent stream, river, or wash

MP	Stream Name	Stream Type
85.5		Intermittent stream, river, or wash
85.7	Strawberry River	Perennial stream or river
Segment 3		
87.3	Strawberry River	Perennial stream or river
Segment 4		
89.0		Intermittent stream, river, or wash
91.5		Intermittent canal, ditch, or aqueduct
92.1		Intermittent stream, river, or wash
93.3		Intermittent stream, river, or wash
94.4		Intermittent stream, river, or wash
95.4		Intermittent stream, river, or wash
95.7	Gray Mountain Canal	Intermittent canal, ditch, or aqueduct
96.1		Intermittent stream, river, or wash
97.3	Antelope Creek	Perennial stream or river
97.6		Intermittent canal, ditch, or aqueduct
98.4		Intermittent stream, river, or wash
98.9		Intermittent canal, ditch, or aqueduct
99.2		Intermittent canal, ditch, or aqueduct
100.3		Intermittent stream, river, or wash
100.8		Intermittent canal, ditch, or aqueduct
102.0		Intermittent canal, ditch, or aqueduct
102.5		Intermittent canal, ditch, or aqueduct
103.6		Intermittent canal, ditch, or aqueduct
104.1		Intermittent canal, ditch, or aqueduct
104.7	Myton Townsite Canal	Intermittent canal, ditch, or aqueduct
104.8		Intermittent canal, ditch, or aqueduct
105.1		Intermittent canal, ditch, or aqueduct
105.2		Perennial canal, ditch, or aqueduct
105.4	Duchesne River	Perennial stream or river
106.4	Dry Gulch Canal	Intermittent canal, ditch, or aqueduct
107.7	South Lateral C Canal	Intermittent canal, ditch, or aqueduct
108.3		Intermittent stream, river, or wash
108.7	North Lateral C Canal	Intermittent canal, ditch, or aqueduct
109.5	Sheehan Lateral	Intermittent canal, ditch, or aqueduct
110.6	Dry Gulch Creek	Perennial stream or river

MP	Stream Name	Stream Type
111.4		Intermittent canal, ditch, or aqueduct
Segment 5		
112.5		Intermittent stream, river, or wash
112.7		Intermittent stream, river, or wash
112.7	Hancock Lateral	Intermittent canal, ditch, or aqueduct
113.9		Intermittent canal, ditch, or aqueduct
114.7	Cottonwood Creek	Perennial stream or river
116.0		Intermittent canal, ditch, or aqueduct
116.3	Pickup Wash Lateral	Intermittent canal, ditch, or aqueduct
117.7		Intermittent stream, river, or wash
Segment 6		
118.5	Harding Lateral	Intermittent canal, ditch, or aqueduct
118.8	Montes Creek	Perennial stream or river
119.4	Bench Canal	Intermittent canal, ditch, or aqueduct
120.3		Intermittent stream, river, or wash
121.1		Intermittent stream, river, or wash
121.7	Uinta River	Perennial stream or river
125.0		Intermittent stream, river, or wash
125.5	Ouray Park Canal	Intermittent canal, ditch, or aqueduct
126.0	Moffat Canal	Intermittent canal, ditch, or aqueduct
126.3		Intermittent stream, river, or wash
127.9		Intermittent stream, river, or wash
128.1	Ouray Valley Canal	Intermittent canal, ditch, or aqueduct
129.6	Sand Wash	Intermittent stream, river, or wash
130.6		Intermittent stream, river, or wash
131.0	Halfway Hollow	Intermittent stream, river, or wash
132.5		Intermittent stream, river, or wash
133.7		Intermittent stream, river, or wash
133.8	Twelvemile Wash	Intermittent stream, river, or wash
135.4		Intermittent stream, river, or wash
135.4		Intermittent stream, river, or wash
135.9		Intermittent stream, river, or wash
137.0		Intermittent stream, river, or wash
138.1		Intermittent stream, river, or wash
138.8		Intermittent stream, river, or wash

MP	Stream Name	Stream Type
139.3		Intermittent stream, river, or wash
140.1	Highline Canal	Intermittent canal, ditch, or aqueduct
141.2	Ashley Upper Canal	Intermittent canal, ditch, or aqueduct
Segment 7		
142.3	Steinaker Service Canal	Intermittent canal, ditch, or aqueduct
142.6	Ashley Central Canal	Intermittent canal, ditch, or aqueduct
142.8		Intermittent stream, river, or wash
146.6		Intermittent stream, river, or wash
147.1		Intermittent stream, river, or wash
147.9	Ashley Central Canal	Intermittent canal, ditch, or aqueduct
Segment 8		
148.8		Intermittent stream, river, or wash
149.5		Intermittent stream, river, or wash
151.1		Intermittent stream, river, or wash
151.4		Intermittent stream, river, or wash
152.6		Intermittent canal, ditch, or aqueduct
153.4		Intermittent stream, river, or wash
153.7		Perennial stream or river
154.5		Intermittent canal, ditch, or aqueduct
155.1		Intermittent stream, river, or wash
155.6		Intermittent canal, ditch, or aqueduct

Source: ESRI 2005

[a] Not all features are named.

[b] Corridor segments as defined in Section 1.2 and as shown on Figure 1-1.

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Appendix C. Federal and State Listed Sensitive Species for Counties along U.S. 40 in the Project Corridor

Species	Status[a]	County[b]	Segments[c]
Birds			
American white pelican *Pelecanus erythrorhynchos*	SPC	Ui	1-4
Black swift *Cypseloides niger*	SPC	Du, Ui, Wa	-
Bobolink *Dolichonyx oryzivorus*	SPC	Ui, Wa	2-6
Burrowing owl Athene cunicularia	SPC	Du, Ui	4-8
Ferruginous hawk *Buteo regalis*	SPC		2,6
Greater sage-grouse *Centrocercus urophasianus*	SPC	Du, Ui, Wa	2
Lewis's woodpecker *Melanerpes lewis*	SPC	Du, Ui, Wa	-
Long-billed curlew *Numenius americanus*	SPC	Du, Ui, Wa	2-6
Northern goshawk *Accipiter gentilis*	CS	Du, Ui, Wa	1-2
Short-eared owl *Asio flammeus*	SPC	Du, Ui, Wa	4-8
Southwestern willow flycatcher *Empidonax traillii extimus*	ESA	Ui	4
Mexican spotted owl *Strix occidentalis lucida*	ESA	Du, Ui	-
Three-toed woodpecker *Picoides tridactylus*	SPC	Du, Ui, Wa	1-2
Whooping crane *Grus americana*	ESA	Ui, Wa	-
Yellow-billed cuckoo *Coccyzus americanus*	ESA	Du, Ui, Wa	4
Fishes			
Bluehead sucker *Catostomus discobolus*	CS	Du, Ui, Wa	All
Bonneville cutthroat trout *Oncorhynchus clarkii utah*	CS	Du, Wa	1-2

Species	Status[a]	County[b]	Segments[c]
Bonytail *Gila elegans*	ESA	Ui	7-8
Colorado pikeminnow *Ptychocheilus lucius*	ESA	Ui	5-8
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	CS	Du, Ui, Wa	1-2
Flannelmouth sucker *Catostomus latipinnis*	CS	Du, Ui	All
Humpback chub *Gila cypha*	ESA	Ui	
Leatherside chub *Gila copei*	SPC	Wa	1-2
Razorback sucker *Xyrauchen texanus*	ESA	Ui	5-8
Roundtail chub *Gila robusta*	CS	Du, Ui, Wa	2-8
Mammals			
Black-footed ferret *Mustela nigripes*	ESA[d]	Du, Ui	4-8
Big free-tailed bat *Nyctinomops macrotis*	SPC	Ui	6-8
Brown (grizzly) bear *Ursus arctos*	ESA[e]	Du, Ui, Wa	-
Canada lynx *Lynx canadensis*	ESA	Ui, Wa	1-2
Fringed myotis *Myotis thysanodes*	SPC	Du, Ui, Wa	2-8
Gray wolf *Canis lupus*	ESA[e]	Du	-
Kit fox *Vulpes macrotis*	SPC	Du, Ui	4-8
Spotted bat *Euderma maculatum*	SPC	Du, Ui	2-8
Townsend's big-eared bat *Corynorhinus townsendii*	SPC	Du, Ui, Wa	1-2
White-tailed prairie-dog *Cynomys leucurus*	SPC	Du, Ui	4-8
Reptiles and Amphibians			
Columbia spotted frog *Rana luteiventris*	CS	Wa	1-2
Cornsnake *Elaphe guttata*	SPC	Ui	6-8

Species	Status[a]	County[b]	Segments[c]
Smooth greensnake *Opheodrys vernalis*	SPC	Du, Ui, Wa	1-2
Western toad *Bufo boreas*	SPC	Du, Wa	2,4
Mollusks			
Eureka mountainsnail *Oreohelix eurekensis*	SPC	Du	1-2
Plants			
Alcove bog-orchid *Habenaria zothecina*	SPC	Ui	8
Barneby ridge-cress *Lepidium barnebyanum*	ESA	Du	2, 4
Clay reed-mustard(aka Clay thelopody) *Glaucocarpum argillacea* (aka *Schoencrambe argillacea*)	ESA	Ui	4-6, 8
Duchesne greenthread *Thelesperma caespitosum*	SPC	Du	4-5
Goodrich's blazingstar *Mentzelia goodrichii*	SPC	Du	2, 4
Goodrich's cleomella *Cleomella palmeriana goodrichii*	SPC	Ui	6-8
Goodrich's penstemon *Penstemon goodrichii*	SPC	Du, Ui	5-6
Graham's penstemon (aka Graham's beardtongue) *Penstemon grahamii*	SPC	Du, Ui	4-6, 8
Hamilton milkvetch *Astragalus hamiltonii*	SPC	Ui	5-6
Huber's pepperplant *Lepidium huberi*	SPC	Ui	6, 8
Ownbey's thistle *Cirsium ownbeyi*	SPC	Ui	8
Park rockcress *Arabis vivariensis*	SPC	Ui	8
Rock hymenoxys *Hymenoxys lapidicola*	SPC	Ui	8
Shrubby reed-mustard *Glaucocarpum suffrutescens* (= *Schoencrambe suffrutescens*)	ESA	Du, Ui	5-6, 8
Uinta Basin hookless cactus *Sclerocactus glaucus (= S. brevispinus & S. wetlandicus)*	ESA	Du, Ui	4-6, 8
Untermann's daisy	SPC	Du, Ui	2, 4, 5

Species	Status[a]	County[b]	Segments[c]
Erigeron untermannii			
Ute ladies'-tresses *Spiranthes diluvialis*	ESA	Wa, Du, Ui	1-2, 4-6, 8
White River penstemon *Penstemon scariosus* var. *albifluvis*	SPC	Ui	6, 8

Sources: BLM 2005; DWR 2006, 2007; USFWS 2006

[a] ESA = Federally listed endangered, threatened, or candidate; SPC = State or BLM species of concern; CS = Conservation Agreement Species

[b] Du = Duchesne County; Ui = Uinta County; Wa = Wasatch County

[c] Segments represent approximate areas of the county where the species could exist, not necessarily potential habitat along that segment(s) of U.S. 40.

[d] Experimental

[e] Extirpated

Appendix D. Summary of Cultural Resources along the U.S. 40 Project Corridor

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ONE COMPANY
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Memo

To:	Sue Lee, Salt Lake City		
From:	Mark Brodbeck	Project:	U.S. 40 Corridor Study
c:			
Date:	May 23, 2007	Job No:	54622

Re: U.S. 40 Corridor Study Cultural Resources Report

Setting

The U.S. Highway 40 (U.S. 40) Corridor Study focuses on a 135.7-mile segment of the highway in northeast Utah, in Wasatch, Duchesne, and Uintah Counties. The highway corridor begins at milepost (MP) 21.4 southeast of Heber City and ends at MP 157.1 at the town of Jensen. This region is part of the Uinta Basin of the Colorado Plateau and part of the Great Basin culture area. Prehistoric and historic archeological sites are abundant, representing over 10,000 years of human occupation. This stretch of U.S. 40 is a historic transportation route that passes through several historic towns and rural agricultural areas. It also is within the traditional rangelands of several contemporary Native American tribes.

Geographically, the U.S. 40 corridor begins in Wasatch County southeast of Heber City at MP 21.4. The corridor extends southwestward through Daniels Canyon to Strawberry Reservoir on the Uinta National Forest. The highway then turns due east extending through Deep Creek Canyon and crossing Currant Creek into Duchesne County, extending to the small community of Fruitland at about MP 62.0. From Fruitland, the highway continues in an easterly direction, crossing Red Creek and the Strawberry River, to the town of Duchesne at about MP 86.0, where the highway extends through the center of town along Main Street. From Duchesne, U.S. 40 continues to the east following the Duchesne River, past the town of Bridgeland, which sits on a bypassed segment of the old highway, and across portions of the Uintah and Ouray Indian Reservation. At MP 105.0, the highway turns northward passing through the west side of the town of Myton and across the Duchesne River. U.S. 40 continues in a north-northwesterly direction to the town of Roosevelt at about MP 115.0 and enters Uintah County. The highway enters Roosevelt from the south along North 200 Street East and, at the center of town, turns dues east along East 200 Street North. From Roosevelt, U.S. 40 heads east past Fort Duchesne, where it crosses the Uinta River, and the small town of Gusher at about MP 125.0. The highway then trends to the northeast to Vernal situated on the south side of Ashley Creek at about MP 143.0. U.S. 40 passes through the center of Vernal along Main Street. From Vernal, the U.S. 40 corridor turns to the south and southeast through the Ashley Valley, passing through the unincorporated community of Naples and across Ashley Creek, and ending at the town of Jensen, where the highway crosses the Green River at MP 157.1.

Resource Overview

The results of a cursory records check at the Utah Division of State History Office on May 7, 2007, indicate that while several cultural resource projects have taken place along the U.S. 40 corridor, large stretches remain unevaluated for cultural resources (for example, Bernard 2000; Billat 2003; Billat and Baker 1989; Crosland 2001, 2002; Hutmacher 2003; Polk 1992; and Polk and Weymouth 1993). A list of state-identified sites is included as an attachment to this report. Further project-related investigations would include a Level I records check through the Division of State History, State Historic Preservation Office that would reveal such additional sites.

An important component of future highway improvements in the U.S. 40 study area will be a consideration of potential effects to cultural resources. This cultural overview provides a context for understanding the types of archaeological and historic sites that could be encountered along the highway corridor. The region's cultural chronology is defined by five main developmental periods representing distinct adaptations to social and environmental conditions: the Paleo-Indian Period, the Archaic Period, the Formative Period, the Late Prehistoric Period, and the Historic Period.

Paleo-Indian Period (12,000–5000 BC)

The earliest evidence of human occupation dates to the Paleo-Indian Period, which represents human adaptations to terminal Pleistocene environments that were cooler and moister than present (Bettinger 1999; Grayson 1993; Madsen 1989). During this time, extensive marshlands and shallow lakes were more abundant in the Great Basin and woodland environs extended to lower elevations than today (Grayson 1993). Paleo-Indian groups are characterized as highly mobile bands of hunter-gatherers who employed a subsistence economies focused on combinations of hunting Pleistocene mega-fauna, gathering wild foods, and exploiting lacustrine resources (Cordell 1984; Elston 1982; Jones and Beck 1997; Madsen 1982; Schroedl 1976). Evidence of Paleo-Indian occupation has been found throughout Utah; however, such sites are rare given their age and generally sparse accumulations of cultural remains (Cordell 1984). Diagnostic artifacts from this time period include distinctive forms of fluted spear points, known as Clovis and Folsom points, and later stemmed points of the Plano Complex.

Archaic Period (5000 BC–AD 300)

Following the end of the Pleistocene and extinction of the mega-fauna, the Holocene era began a transition toward warmer and drier climatic conditions, glacier retreat, and a series of changes in flora and fauna (Antevs 1948; Grayson 1993). Human adaptations to the changed conditions are reflected in the Archaic Tradition characterized by small bands of hunter-gatherer groups exploiting resources in a seasonal round and the development of regionally district cultural patterns. The appearance of new project points types and the development of the atlatl indicate an emphasis of hunting medium- and smaller-sized animals (Grayson 1993). An increased reliance on processed plant resources through time is reflected by increased prevalence of ground stone tools in later assemblages.

The Archaic Period is subdivided into Early, Middle, and Late phases based on distinct patterns of material cultural detectable in the archaeological record. Although evidence of Early Archaic sites (about

5000–3000 BC) is rare in comparison to the later Middle and Late sites, early components have been identified in the Uinta Basin at sand dune sites and rock shelters primarily clustered in the lower White River drainage (Spangler 1995). During the Middle Archaic (about 3000–500 BC), human populations appear to increase based on the number of identified sites, a nomadic hunter-gatherer subsistence pattern persists, and the appearance of the distinctive McKean Complex projectile points suggests cultural influences from the northwest plains (Spangler 1995). The Late Archaic (about 500 BC–AD 300) in the Uintah Basin is distinguished by continued increases in population densities, the introduction of maize agriculture, and the arrival of bow and arrow technology. Furthermore, the use of more permanent structures indicates increased sedentism, although a mobile hunter-gathering subsistence remained prominent.

Formative Period (AD 300–1200)

The Formative Period in northern Utah spans from approximately AD 300 through about 1200 and is marked by the development of the Fremont culture. Although people developed agriculture and more permanent settlements during this time, hunting and gathering continued to be important subsistence practices. Morss (1931) first described the Fremont culture as a peripheral variant of the Anasazi; however, subsequent researchers have convincingly argued that the cultural traits of this era in northern Utah warrant distinction as a separate archaeological culture (Cordell 1984). As summarized by Barlow (2002, 65–67):

> The characteristics that distinguish Fremont material culture from other Southwestern traditions include a local variety of 8–14-rowed dent maize, often hafted on sticks; ceramics that are usually plain gray ware but sometimes decorated with appliqués, indentations or painted designs; small, regionally distinctive projectile-point types; a single-rod-and-bundle basket construction; large “Utah-type” trough metates with a distinctive shelf and secondary grinding depression; ground-stone balls; leather moccasins; and broad-shouldered anthropomorphic clay figurines and rock-art figurines with elaborate headdresses, necklaces, and earrings (Adams 1994; Aikens 1966; Cutler and Blake 1970; Madsen 1989; Marwitt 1970; Morss 1931; Winter and Hogan 1986; Winter and Wylie 1974).

The Fremont tradition fades from the archaeological record around AD 1200. Archaeological evidence suggests that Numic speakers from the Mojave Desert appeared in Utah sometime around AD 1100. Their archaeological remains primarily consist of lithic scatters with low quantities of brownware ceramics, rock art, and occasional wickiups. The influx of new people precipitated a shift back to a hunter-gatherer way of life.

Late Prehistoric Period (AD 1300–1826)

Concurrent with the arrival of new occupants into the region at the end of the Formative Period, changes in artifact styles and subsistence patterns define the Late Prehistoric Period (about AD 1200–1826). For example, the Desert Side-notched and Cottonwood Triangular projectile points and Intermountain Brownware or Shoshonean Ware became common in the region. For the eastern regions of the Great Basin, a review of available archaeological data also indicates a change in settlement patterns, subsistence behavior, material culture, footwear, trade patterns, and mortuary practices between AD 1200 and

AD 1600 (Janetski 1994). Janetski notes that Steward's 1940 model of migrationist expansion by Numic groups appears to best fit these changes.

More recent research agrees with Steward's model and has led archaeologists to believe that these changes support what they now refer to as the Numic Expansion theory, which contends that late in the prehistoric sequence, Numic language speakers moved into the Great Basin from the Mojave Desert (Madsen 1975; Steward 1938; Bettinger and Baumhoff 1982; Rhode and Madsen 1994). The documentation of Numic-speaking groups in the area at the time of Euro-American contact also supports this theory. Whether the changes noted in the material culture represent a replacement of indigenous populations, the absorption of indigenous populations into new linguistic and cultural groups, or simply cultural change by indigenous populations, however, remains open for debate (Aikens and Witherspoon 1986; Lyneis 1982; Norman and others 1982a).

By the time of historical contact with Euro-Americans in the late 1700s, the Ute, Shoshone, and Paiute, all groups that speak Numic languages, lived in the Uinta Basin (Newton 2001). Additionally, the introduction of the horse by 1750 further affected subsistence patterns and social organization, most notably through a greater emphasis on hunting (Ricks 1956) and a shift from a loose alliance of small extended family groupings to more formal tribal identities and band loyalties (Parry 2000).

Historic Period (AD 1826 – present)

European settlement of the Uinta Basin was spurred by the many natural resources present in the area. Fur traders are among the non-native inhabitants to first exploit the area. Lands with farming potential and plentiful water resources further attracted immigrants to the area. Oil and mineral deposits also played a role in the continuing development of many towns as well as transportation systems. Among others, communities such as Duchesne, Vernal, Roosevelt, Bridgeland, and Myton still exhibit historic period buildings, canals, and roads. Native culture also continues to flourish in the region.

First Europeans

Europeans first entered the Uinta Basin in the late 1700s. In 1776, the Spanish friars Francisco Atanasio Dominquez and Silvester Velez De Escalante entered Utah near the present-day Vernal and camped near Myton, referring to the area as La Ribera de San Cosme. Following the Duchesne River west to the present site of Duchesne, then following the Strawberry River to Diamond Fork, they turned south toward Spanish Fork Canyon (Auerbach 1941; Barton 1996; Bolton 1972; Burton 1996). On September 23, the friars entered Utah Valley at the present location of Spanish Fork. Their route took a southwesterly course through Utah, then turned southeast and returned to Santa Fe. In 1844, John C. Fremont entered the southwestern corner of Utah. He traveled through the territory in a northeasterly direction, passing along the western edge of the Wasatch Front until he reached the mouth of Spanish Fork Canyon. He then traveled through the canyon, found a passage (possibly Nine Mile Canyon) into the Uinta Basin, and crossed the basin, exiting Utah near present Dutch John (Miller 1986; Southworth and others 1990).

Beginning around 1820, the Uinta Basin became important in the fur trade (Burton 1996). Several fur companies focused their attention on the beaver-rich rivers of the Uinta Basin. For the next 25 years, trappers from many different countries ranged throughout the basin, but stayed mainly near the larger streams and rivers. After the end of the fur-trading era, the Uintah Basin was not occupied by significant numbers of Euro-Americans until the late 1870s (Barton 1996). News about the Ute Indians slowed Euro-Americans interest in the region until John Wesley Powell released more favorable reports about the area around 1871; then ranching and farming began to take hold. The area, however, remained geographically isolated from the rest of Utah until roads were built to serve the needs of the various army posts in the region. An early military supply route was the precursor to the highway crossing the region, now known as U.S. 40.

Early Settlement

Acting as territorial governor, the Mormon leader Brigham Young established the Utah territory in 1850. Shortly afterward, Mormon settlers moving onto traditional tribal lands precipitated a period of conflict between settlers and Native American tribes. As Mormon populations grew and displaced local Ute tribes, relationships between the two disintegrated into a series of raids and armed conflicts. In an effort to relocated Native Americans, Young sent expeditionary parties to the Uintah Basin to assess the region’s potential for settlement in 1852 and again in 1861. Both expeditions reported that the Uintah Basin was unsuitable for agriculture and was undesirable for Mormon settlement but that it was suitable place to relocate the Ute Indians (Spangler 1995), effectively isolating them from Mormon settlements (Barton 1996). Subsequently, Mormon leadership petitioned the U.S. government to move the tribes onto a reservation located in the Uintah Basin. Motivated by Mormon pressure and other economic and demographic factors, the federal government forcefully moved several Ute tribes onto the Uintah Valley Indian Reservation in 1864.

Moving the Utes onto a reservation in the Uinta Basin did not close the book, however, on poor inter-government relations, and it in turn spurred conflict between neighboring Ute tribes as well. For example, a series of armed conflicts between miners and Utes in western Colorado led to the removal of Ute tribes in that state to the Uinta Reservation in 1877. By 1880, most of the Colorado Utes were living on reservations in the Uinta Basin, sharing lands with the Uinta Utes. Crowding on the reservation and the loss of traditional land and lifestyle caused conflict between the various tribes. Further tension developed in 1905 when the U.S. government declared the reservation open to non-native settlement because mineral resources had been discovered (Spangler 1995).

The opening of the Ute Reservation to homesteading in 1905 led to the development of communities, villages, and towns in the Uintah Basin (Barton 1996). The cities of Myton, Roosevelt, and Duchesne quickly grew with farms and ranches, commercial establishments, mercantile companies, dance halls, and even baseball teams. Duchesne County was created in 1914 with nearly 4,000 residents. World War I and the Great Depression severely slowed settlement of the Uintah Basin. The decades following the Depression saw a renewed increase in economic growth and population. Oil was discovered on Ute tribal land in the early 1950s. Roads, schools, government buildings, churches, and hospitals were built. Farming and ranching continued to be economically important while natural resources, such as minerals, timber, water, and oil, were increasingly used. The Echo Park Dam, the Upper Stillwater Dam, and the Starvation Reservoir were created as part of the Central Utah Project (Hutmacher 2003).

Transportation

The development of transportation and, eventually, highway routes across the Uintah Basin began with the initial exploration and settlement of the area. As pioneers began to settle the Uintah Basin, the Dominguez and Escalante Trail, as well as others, developed into commonly used wagon roads and supply routes. E.L. Berthoud and Jim Bridger surveyed and built the first formal wagon road through the basin in 1861. Additionally, a stage line ran between Salt Lake City and Duchesne from 1912 to about 1917 (Barton 1996). Presumably following one or both of the old wagon routes, the stage carried passengers and mail until the service was discontinued in favor of mail delivery by trucks. Since the Uinta Basin did not have train service, travelers were forced to find their own transportation between the Uinta Basin and the Wasatch Front.

In 1914, the first ocean-to-ocean scenic highway, which would cross Utah, went into the planning stages (Burton 1996). Part of the planning was to use established routes across the American West as part of the ocean-to-ocean highway system. As such, Salt Lake City became a hub for highway connections. The wagon routes across the Uintah Basin between Heber City, Utah, and Dinosaur, Colorado, including Vernal's Main Street (which was paved in 1899) were chosen to become part of this highway system.

Today, U.S. 40 generally follows the historic Victory Highway (Burton 1996) and was the first all-weather, direct, transcontinental route across the United States. The Victory Highway originally began in Atlantic City, New Jersey, and ended in San Francisco, California, with about 3,022 miles of road. Dedicated to World War I veterans, the Victory Highway follows portions of the historic Dominguez and Escalante Trail in eastern Utah and the Midland Trail in western Colorado. U.S. 40 became part of the highway system in 1926 and, by the late 1930s, it was paved from Vernal east and connected to the paved portion of the Victory Highway in Colorado (Burton 1996). Unlike the National Road, Lincoln Highway, and Route 66 (other famous highways), the Victory Highway, or U.S. 40, (although it has been realigned) has not lost its original designation as "Route 40" as far west as Park City, Utah (Brusca 2000). Evidence of the early Victory Highway still survives in the Uinta Basin as in-use and abandoned road segments, partial bridge abutments and foundations, highway billboards, retaining walls, wooden mileposts, stone culverts, and unpaved road beds.

Uinta Indian Irrigation Project

As early as the 1870s, Indian agents assigned to the Uinta Indian Reservation recognized the need for irrigation canals if the reservation was to be transformed into productive agricultural land. Indian agent H.P. Myton and the Uinta Indian Commission secured water rights from the state engineer in Salt Lake City. They also made preliminary plans to build an irrigation system to deliver water to the Indian farms; however, this required a great deal of money that the Utes did not have. Without irrigation canals and ditches, under state water law, the Utes would lose their rights to the water (Burton 1996).

By the 1890s, more than a dozen small irrigation canals had been built to service Indian farms. These canals included the Number One, Bench, Henry Jim, Ouray School, Gray Mountain, U.S. Dry Gulch, Ouray Park, North Myton Bench, Lake Fork Ditch, Red Gap, and South Myton Bench canals (Barton 1996). In 1891, Uinta-Ouray Indian agent Robert Waugh suggested a more comprehensive and systematic approach in the construction of Indian irrigation canals. In part because of his suggestions and the work of Minnesota Senator Moses Edwin Clapp, who successfully amended the general Indian appropriations bill, the Uinta Indian Irrigation project was established and Congress agreed to appropriate $600,000 for the project (Barton 1996; Burton 1996). To design, construct, and operate the Uinta Indian Irrigation Project, Congress included it as part of the larger United States Indian Irrigation Service, the Indian counterpart to the Bureau of Reclamation.

Euro-American settlers also faced the challenge of creating canals to deliver water to their farms. The Dry Gulch Irrigation Company was organized to build and manage an irrigation system for non-Indian farmers. It soon became clear that both systems faced similar challenges (Daughters of the Utah Pioneers 1947). Out of necessity, the Ute farmers and the Euro-American settlers in the county agreed to cooperate on the construction of future canals. As a result of this cooperative effort, much of the water used by Indian and Euro-American farmers alike was “mingled” and moved through both Indian and non-Indian land (Barton 1996).

Most of the earthen ditches that cross U.S. 40 belong to the elaborate network of canals built by the Indian Irrigation Service and the Dry Gulch Irrigation Company. For instance, the Harding Lateral (which is a historic property—Site 42Un2672) crosses U.S. 40 at the base of Indian Bench. The Harding Lateral originates at Montes Creek Reservoir, roughly 4 miles northwest of the point where it meets U.S. 40. Irrigation water is carried over the highway in a metal flume, which is supported by concrete abutments that stand within the highway’s right-of-way. Pickup Wash Lateral (another known Historic Property—Site 42Un2671) intersects the highway’s southern right-of-way east of Roosevelt (Burton 1996). The Pickup Wash Lateral originates 5 miles north of Roosevelt in an area known as the Crescent. Many other historic canal segments exist through the Uinta Basin including the Steinaker Ditch, the Highline Canal, and the Ashley Upper Canal.

Towns along U.S. 40

With the presidential proclamation in 1905 that opened all unallotted reservation land to non-Indian settlers, a land rush ensued. As hundreds of settlers and would-be miners rushed to the area, several towns and communities were established, including Heber City, Duchesne, Myton, Bridgeland, Roosevelt, and Gusher (Van Cott 1990). Much of the following material is summarized from key cultural resources reports (Bernard 2000; Billat 2003; Colman 2001; Hutmacher 2003; Mahoney 1997; Norman 1996; Norman and others 1982a; Polk and Weymouth 1993; Sagebrush Archaeological Consultants 1996) and National Historic Property and Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) forms on file at the State History Division.

By the end of the first quarter of the 20th century, the Uinta Basin area had established itself as a prominent, thriving region of Utah. Farming was well established, and the mining economy was growing with the extraction of gilsonite, asphalt, and other minerals. Oil field development had begun and a good transportation corridor was in place with the opening of U.S. 40 from Salt Lake City to Denver in 1927 (Stewart 1953).

Heber City. Heber City is situated along U.S. 40 several miles northwest of the west end of the U.S. 40 study area. Heber City, which was named after Heber C. Kimball, was first settled in the mid-1800s by pioneers that ventured up Provo Canyon to farm in the rich floodplain of the Provo River. The settlers constructed the first homes in a fortified arrangement for protection at what would become the center of town. Heber City was incorporated in 1889 and it was the first town to be created in Wasatch County. The town's current population is includes about 8,000 residents.

Fruitland. Fruitland is small, unincorporated, rural community situated along U.S. 40 near MP 62.0, about 2 miles west of Red Creek. USGS topographic maps indicated a small cemetery located on the south side of U.S. 40, about 1 mile west of town.

Duchesne. The city of Duchesne is situated at the confluence of the Duchesne River and the Strawberry River. U.S. 40 passes through the center of the town along Main Street at about MP 86.0, which is lined by several historic homes and businesses. The town came into being in 1905 when the United States government opened the region to homesteading under the Allotment Act. On January 1, 1915, the eastern portion of Wasatch County was split off to form Duchesne County; by a vote of county citizens, Duchesne City became the county seat. Today, Duchesne is a community of about 1,200 people with a local economy centered in the farming and oil industries.

Bridgeland. Bridgeland is a unincorporated, rural, agricultural community situated 10 miles east of Duchesne along a bypassed segment of old U.S. 40, now designated U-86. The community is centered around the old U.S. 40 crossing of the Duchesne River where a bridge built in the early 1900s still remains. A local resident named William Smart recommended the name Bridgeland because the bridge drew the neighboring communities of Antelope and Arcadia closer together (Billat 2003). The current alignment of U.S. 40 bypasses Bridgeland at about MP 95.0, passing about 0.5 mile to the south.

Myton. The town of Myton is situated along U.S. 40 between Duchesne and Roosevelt at about MP 105. The highway passes through the side of the town where it crosses in Duchesne River. The town's origins began in the mid-1880s with the establishment of a trading post by William Henderson of Vernal. Initially, the one-building post served a small segment of the Indian population until 1886 when the army built a bridge over the Duchesne River at the location and constructed a road between Price and the newly established Fort Duchesne. The trading post's location next to the only bridge across the river increased its business and its importance in the area. It subsequently became known as "The Bridge" or "Bridges" (Barton 1996).

The Bridge housed federal government surveyors and members of the Uintah Indian Commission. Major Howell Plummer Myton, Indian agent for the combined Uintah and Ouray Indian Agency, spent considerable time at the post making preparations for the opening of unallotted Indian land in 1905. The Bridge quickly transformed the area into a small community. In the process of securing a post office for the new community, the town was named Myton by Joseph Briston, a Post Office official in Washington D.C., who was a friend of Howell Myton. Over the next 5 years, Myton became the business and financial center for the county. It soon boasted many establishments including two hotels, a blacksmith shop, a furniture store, a lumber mill, a church and a school, a physician, a realtor, an opera house, and several general stores. Today, the remaining historic structures in Myton mainly consist of small, single dwellings built around or soon after the turn of the 20th century.

Roosevelt. The town of Roosevelt is situated along U.S. 40 at about MP 115.0. The town is bisected by Cottonwood Creek. U.S. 40 passes through the center of the town, heading north-south on South 200 Street North and then east-west along East 200 Street North. The highway passes through the town's historic commercial downtown and by a handful of historic residences. The historic State Land Lateral Canal crosses U.S. 40 on the east side of town.

The town's origins began in 1905 when the unallotted land of the Ute Indian Reservation was opened to homesteading through an act of Congress. Roosevelt was founded in early 1906 when Ed Harmston turned his homestead claim into a town site and laid out plots. His wife named the prospective town in honor of the president of the United States, Theodore Roosevelt. Within a short time, a store, a post office, and the Dry Gulch Irrigation Company were in business in the new town. In 1907, the Harmstons donated 2 acres of land for the town's citizens to build a school. The first class had about 15 pupils. Roosevelt soon became the economic center for the area, eclipsing Myton and Duchesne. The town was incorporated in 1913 and serves as the business center for the surrounding rural communities. Today, Roosevelt is home to about 3,500 people with a local economy based primarily on agriculture and the oil industry.

Fort Duchesne. U.S. 40 passes through Fort Duchesne on the Uintah and Ouray Indian Reservation at about MP 122.0, where the highway crosses the Uinta River. The historic fort complex is situated about 0.75 mile south of the highway along 7500 East Street. A cemetery is adjacent to the south side of the highway about 0.5 mile west of 7500 East Street, just east of the reservation boundary.

Fort Duchesne was established in 1886 to control Indian conflicts and assert United States military presence in the Uintah Basin (Barton 1996). By 1887, a telegraph line was completed to link the fort with other military posts and headquarters. A year later, a supply road and stage line was built from the fort to Price through Nine Mile Canyon. The Nine Mile Road became a heavily traveled route for passengers, mail, and freight.

The military maintained a presence at Fort Duchesne until 1912 when it was transferred over to the U.S. Indian Service, which used the site to consolidate its Uintah and Ouray operations. Today, Fort Duchesne serves as the tribal headquarters for the Uintah and Ouray Indian Reservation. Other historic routes associated with the U.S. 40 corridor include the Wing Song Store, which was built in 1890 and moved to its current location along the highway in 1934, and the U.S. Dry Gulch Canal, which was constructed in 1905 by the New Hope Irrigation Company.

Gusher. The town of Gusher is along U.S. 40 at about MP 125.0, about 2 miles east of Fort Duchesne. The town is a small rural community with several historic residences. Originally called Moffat in honor of David H. Moffat, a railroad magnate, Gusher was settled in 1888. The name was changed in 1922 because of the existence of Moffat, Colorado. The new name was given at a time when residents anticipated an oil gusher, which failed to materialize (Daughters of the Utah Pioneers 1947). The Henry and Mary Harris house, the Muse K. Harris cabin, and the Mary L. Naylor Hotel all date to Gusher's early historic period.

Vernal. The town of Vernal is situated along U.S. 40 near Ashley Creek at about MP 145.0. The highway passes through the center of down along Main Street, which is lined with historic commercial properties with historic residences in close proximity.

The history of Vernal began with settlers moving into the Ashley Valley in the 1870s. Following the Meeker Massacre of 1879, many settlers banded together for protection. They dismantled their cabins and left their homesteads, reconstructing them together into a three-sided fort on “the Bench,” a geologic landform with easily defensible open-expanse (Daughters of the Utah Pioneers 1947; Burton and Jolley 1989). Once tensions subsided, many families moved their cabins back to their homesteads, while others remained at the fort which eventually became the town known as Ashley Center. A store was opened and the residents applied for a post office. The name Ashley Center was requested, but it was too similar to the town of Ashley; therefore, the name Vernal was assigned to the community by the U.S. Postal Department.

The beginnings of a commercial district began to emerge in the small town with the establishment of the Ashley Co-op in 1881 (Burton and Jolley 1989) and the Blyte and Mitchel Store in 1885. The 1890s also saw homesteading and coal and gilsonite mining activity increase dramatically giving rise to the town’s first big population boom. During this time, the town’s official boundaries were recorded in a patent in 1896 that included 640 acres. In 1905, portions of the Uintah Reservation were opened to homesteading causing a population boom in Vernal and the surrounding areas. Increased mining and agriculture began to build a strong economic base in the Ashley Valley. Over time, the town has continued to grow and develop following the prosperity and declines of the agricultural and oil industries (Hugie 1985; Polk and Weymouth 1993).

Many historic-period structures remain standing in Vernal; some are still in use. The Bank of Vernal, built in 1916, is a prominent feature of Main Street. St. Paul’s Episcopal Church and Lodge, also located on Main Street and built in 1901 and 1919 respectively, also continue to serve the community. Numerous other prominent historic properties line Main Street including the Ashley Cooperative, the post office, the Langston home, and the Bennion, Hatch, and Bascom houses

Naples. Naples is an rural agricultural community dispersed along U.S. 40 in the vicinity of MP 145.0, east of Ashley Creek and about 2 miles southeast of Vernal. The settlement was named for the prominent city in Italy. It also had earlier names such as Merrill for Porter William Merrill, a local church official; Riverdale, because it was located on the Green River; and Frogtown, because of the large number of frogs in the vicinity. Bishop P.W. Merrill suggested that the name be changed from Merrill to Naples (Online Utah 2007). Several historic buildings survive in the community such as the Samira and Richards House, which is a bungalow-style structure built around the turn of the 20th century.

Jensen. The town of Jensen is situated at the east end of the U.S. 40 study area at MP 157.1 on the east side of the Green River. Several historic structures and buildings have been documented in Jensen such as the Jensen Bridge built in 1933 over the Green River, the Clark/Mix/Stewart cabin built around 1930, the Bridge Inn built in 1931, and an unnamed cottage adjacent to U.S. 40 built in 1945.

Summary

The U.S. 40 study area extends across a vast portion of the Uintah Basin that is rich in prehistoric and historic cultural resources. Future improvement projects along the highway corridor are likely to encounter a variety of prehistoric and historic archaeological sites dating from a broad range of time periods. The Uintah Basin is within the tradition rangelands of several Native American tribes, and traditional cultural properties could also be encountered. In addition, U.S. 40 passes through several small communities (such as Fruitland, Bridgeland, and Myton) and larger towns (such as Duchesne, Roosevelt, and Vernal) where historic commercial buildings and residential houses line the highway and can be found in close proximity. Other historic structures include brides, culverts, irrigation canals, and U.S. 40 itself as the historic Victory Highway, which would also need to be considered during future planning efforts.

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Attachment: Recorded Cultural Resources Along U.S. 40

Site Number	Project	USGS Quad. Map	Owner	National Register Status	Date Recorded	Site Type	Date	Comments
42DC000375	U01BS0016	Bridgeland	NA	Determined Eligible (SHPO concurrence)	14-Mar-01	Waterworks; dams, ditches, etc.	1907	Gray Mountain Canal
42DC001329	NA	Hancock Cove	Private	Determined Eligible (SHPO concurrence)	01-Oct-00	Waterworks; dams, ditches, etc.	1907	Martin Lateral
42DC001357	U01BS0016	Myton/Bridgeland	State	Determined Eligible (SHPO concurrence)	13-Mar-01	Transportation	1923	
42DC001357	U01BS0016	Bridgeland	State	Determined Eligible (SHPO concurrence)	13-Mar-01	Transportation	1923	Highway 40/ #14 Myton
42DC001357	U00BS0762	Fruitland	State	Determined Eligible (SHPO concurrence)	08-Dec-00	Transportation	1880	
42DC001381	U01BS0016	Myton	Private	Determined Eligible (SHPO concurrence)	14-Mar-01	Waterworks; dams, ditches, etc.	1905	
42DC001382	U01BS0016	*Confidential*	Private	Determined Eligible (SHPO concurrence)	13-Mar-01	Artifact Scatter	Prehistoric	Late prehistoric
42DC001383	U01BS0016	*Confidential*	Private	Determined Eligible (SHPO concurrence)	13-Mar-01	Artifact Scatter	Unknown	Unknown aboriginal
42DC001384	U01BS0016	Bridgeland	Private	Non-significant (professional judgment)	13-Mar-01	Farming/Ranching (agriculture)	1940	
42DC001385	U01BS0016	Myton	Private	Non-significant (professional judgment)	13-Mar-01	Farming/Ranching (agriculture)	1940	
42DC001386	U01BS0016	Bridgeland	Private	Non-significant (professional judgment)	13-Mar-01	Farming/Ranching (agriculture)	1940	
42DC001505	U02ST0423	Rabbit Gulch	State	Non-significant (professional judgment)	26-Jul-02	Transportation	1900	
42DC001506	U02ST0423	Rabbit Gulch	State	Determined Eligible (SHPO concurrence)	28-Jul-02	Transportation	1899	Victory Highway
42DC001507	U02ST0423	Strawberry Pinnacles	State	Non-significant (professional judgment)	28-Jul-02	Transportation	1930	

Site Number	Project	USGS Quad. Map	Owner	National Register Status	Date Recorded	Site Type	Date	Comments
42DC001508	U02ST0423	Strawberry Pinnacles	State	Non-significant (professional judgment)	28-Jul-02	Transportation	1926	
42UN001562		Vernal SW	BLM	Non-significant (professional judgment)	30-Sep-85	Waterworks; dams, ditches, etc.	1890	
42UN001562	U00IQ0047	Fort Duchesne	State	Determined Eligible (SHPO concurrence)	15-Jun-00	Transportation	1890	
42UN002671	U00IQ0047	Hancock Cove	Private	Determined Eligible (SHPO concurrence)	01-Apr-00	Waterworks; dams, ditches, etc.	1907	Pickup Wash Lateral
42UN002672	U00IQ0047	Roosevelt	Private	Determined Eligible (SHPO concurrence)	04-Apr-00	Waterworks; dams, ditches, etc.	1907	
42UN002673	U00IQ0047	Whiterocks	Private	Determined Eligible (SHPO concurrence)	04-Apr-00	Waterworks; dams, ditches, etc.	1890	
42UN002674	U00IQ0047	Lapoint	Private	Determined Eligible (SHPO concurrence)	04-Apr-00	Waterworks; dams, ditches, etc.	1906	Moffat Canal
42UN002674	U01BS0353	Fort Duchesne	Private	Determined Eligible (SHPO concurrence)	01-Jun-01	Farming/Ranching (agriculture)	1906	
42UN002675	U00IQ0047	Lapoint	Private	Determined Eligible (SHPO concurrence)	04-Apr-00	Waterworks; dams, ditches, etc.	1907	
42UN002675	U01BS0353	Fort Duchesne	Split Estate	Determined Eligible (SHPO concurrence)	01-Jun-01	Waterworks; dams, ditches, etc.	1908	
42UN002676	U00IQ0047	Steinaker Reservoir	Private	Determined Eligible (SHPO concurrence)	04-Apr-00	Waterworks; dams, ditches, etc.	1913	Highline Canal
42UN002679	U00IQ0047	Whiterocks	Private	Determined Eligible (SHPO concurrence)	15-Jun-00	Waterworks; dams, ditches, etc.	1905	Ouray Valley Canal
42UN002680	U00IQ0047	Steinaker Reservoir	Private	Determined Eligible (SHPO concurrence)	01-Jun-00	Waterworks; dams, ditches, etc.	1880	
42UN002681	U00IQ0047	Roosevelt	Private	Determined Eligible (SHPO concurrence)	15-Jun-00	Waterworks; dams, ditches, etc.	1920	
42UN002915	U01BS0353	Fort Duchesne	Tribal	Determined Eligible (SHPO concurrence)	01-Sep-01	Waterworks; dams, ditches, etc.	1886	

Site Number	Project	USGS Quad. Map	Owner	National Register Status	Date Recorded	Site Type	Date	Comments
42UN002958	U01AY0705	Naples	Private	Non-significant (professional judgment)	01-Nov-01	Farming/Ranching (agriculture)	1890	
42UN002959	U01AY0799	Rasmussen Hollow	Private	Non-significant (professional judgment)	01-Nov-01	Farming/Ranching (agriculture)		
42UN001562	U02ST0021	Cliff Ridge	State	Determined Eligible (SHPO concurrence)	21-Mar-02	Transportation	1880	Victory Highway/US 40
42UN003702	U04MM0007	Vernal SW	State	Non-significant (professional judgment)	15-Apr-04	Farming/Ranching (agriculture)	1919	

Source: Utah Office of State History 2007

Appendix E. National Response Center Spills to Land Listings for the Project Corridor

NRC Report#	Incident Date	Street/Location	County	City	Type Of Incident	Medium Affected	Material Name
95830	11/10/1991	NA	Uintah	Vernal	Fixed	Land	Oil: Crude
263680	09/30/1994	Star Route	Uintah	Vernal	Fixed	Land	Gilsonite
540633	08/31/2000	2160 South 1500 East St	Uintah	Vernal	Storage Tank	Land	Hydrochloric Acid
808971	08/24/2006	721 West 100th South	Uintah	Vernal	Fixed	Land	Mercury
818703	11/20/2006	2160 South at 1500 East	Uintah	Vernal	Storage Tank	Land	Techni-Hiv767w
824745	01/26/2007	64 East Main St	Uintah	Vernal	Fixed	Land	Mercury
95686	11/09/1991	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Gasoline Automotive
115250	04/22/1992	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Gasoline: Automotive (4.23g Pb/G Oil: Diesel
123377	06/23/1992	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Gasoline: Automotive (4.23g Pb/G
136987	09/16/1992	West Hwy 40	Duchesne	Roosevelt	Mobile	Land	Gasoline: Automotive (4.23g Pb/G
204062	10/21/1993	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Oil: Crude
214834	01/02/1994	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Oil: Crude
265289	10/13/1994	West Hwy 40	Duchesne	Roosevelt	Fixed	Land	Oil: Crude
375732	02/06/1997	US 40 West Edge of Roosevelt	Duchesne	Roosevelt	Mobile	Land	Gasoline: Automotive (Unleaded)
387454	05/16/1997	Adjacent to State Hwy 40 at Starvation Reservoir	Duchesne	Duchesne	Fixed	Land	Condensate Plus Produced Water
412085	11/18/1997	Mile 1365 South of Hwy 40 on County Road	Duchesne	Duchesne	Mobile	Land	Oil: Crude
717745	04/02/2004	Intersection of 9900 South, 4500 West 1400 Feet East of the Intersection	Duchesne	Myton	Pipeline	Land	Oil: Crude

NRC Report#	Incident Date	Street/Location	County	City	Type Of Incident	Medium Affected	Material Name
805270	07/23/2006	10530 South County 33	Duchesne	NA	Pipeline	Land	Ethylene Glycol
821630	12/20/2006	Hwy 40 4500 West	Duchesne	Fruitland	Mobile	Land	Oil: Crude
296130	06/19/1995	Hwy 40 2 Mi W of Currant Creek and 32 Mi W of Duchesne at Currant Creek Store and Restaurant	Wasatch	Currant Creek	Mobile	Land	Oil: Crude

Source: National Response Center 2007

Appendix F. Leaking Underground Storage Tank Locations along the Project Corridor

Location Name	Location Street	Location City	Location County	Date Closed
Segment 1				
None				
Segment 2				
Currant Creek Gas N' Grub	Currant Creek Junction Hwy 40	Heber City	Wasatch	28-Jun-02
Strawberry Bay Marina	23 Miles East Hwy 40	Heber City	Wasatch	29-Oct-01
UDOT Sta. 3445	US-40 Strawberry Valley	Heber City	Wasatch	10-Aug-95
Segment 3				
Bonanza Sinclair	94 E Main St	Duchesne	Duchesne	14-Apr-98
Foodtown	171 E Main	Duchesne	Duchesne	02-May-95
Killian's	150 E Main St	Duchesne	Duchesne	13-Jan-98
Longhorn Service, Inc.	72 West Main	Duchesne	Duchesne	
Mariella Potter Family Trust / Rocket Station	200 E Main St	Duchesne	Duchesne	
Rod Harrison	17 E Main St	Duchesne	Duchesne	
Sunrise Chevron	432 W Main St	Duchesne	Duchesne	
Sunrise Chevron	432 W Main St	Duchesne	Duchesne	
UDOT Maint. Yard #634 UHP Pump	261 S 300 E	Duchesne	Duchesne	16-Jul-02
Segment 4				
Gary's Insulation, Inc.	West Hwy 40 N Side Ioka Turnoff	Roosevelt	Duchesne	15-May-95
UDOT Maint. Yard #635 UHP Pump	Hwy 40, 2 Mi W Roosevelt	Roosevelt	Duchesne	
Segment 5				
Basin Diesel Service, Inc.	W Hwy 40	Roosevelt	Duchesne	26-Jan-94
Basin Western Inc.	3639 E Hwy 40 Matlack Terminal	Roosevelt	Duchesne	17-Aug-90
Case Equipment Dealer (Roper Machine)	W Hwy 40	Roosevelt	Duchesne	14-Sep-99

Location Name	Location Street	Location City	Location County	Date Closed
Duchesne County Mosquito Abatement	2010 W 1510 S (West Highway 40)	Roosevelt	Duchesne	
Inland Oil Products	450 W Main St	Roosevelt	Duchesne	27-Mar-97
L.C.L. South	380 S 200 E	Roosevelt	Duchesne	
National Oilwell	West Hwy 40	Roosevelt	Duchesne	
Old West Trading Post	2 Mi E Roosevelt Hwy 40 Ballard	Roosevelt	Duchesne	03-May-95
Prairie Gold Well Service	West Highway 40	Roosevelt	Duchesne	04-May-95
Roosevelt Refinery	West On Hwy 40	Roosevelt	Duchesne	21-Jul-95
Uintah Basin Telephone Assn. Inc	Headquarter Site, W Hwy 40	Roosevelt	Duchesne	12-Jul-96
Union High School	E Hwy 40	Roosevelt	Duchesne	27-Jun-95
Western Petroleum, Inc.	2600 East Highway 40	Roosevelt	Duchesne	28-Jul-00
Segment 6				
Old Hilltop Station	East Us Hwy 40	Fort Duchesne	Uintah	
Outpost Mercantile	Hwy 40 , Box 99	Fort Duchesne	Uintah	15-Nov-99 11-Jun-91
Segment 7				
7-Eleven 1852-24443	2495 S Hwy 40	Naples	Uintah	06-Aug-01 07-Dec-05 25-Jan-99
7-Eleven 1852-22234	910 W Hwy 40	Vernal	Uintah	25-Apr-05
7-Eleven 1852-25824	501 E Main St	Vernal	Uintah	
Baroid Drilling Fluids, Inc.	1092 E Main St	Vernal	Uintah	24-May-90
Chevron #73272	190 E Main St	Vernal	Uintah	07-Mar-97
Dinoland Aviation	830 E 500 S	Vernal	Uintah	12-May-03
Intermountain Concrete Company	625 E Main St	Vernal	Uintah	15-May-95
Lynn's Texaco	199 W Main St	Vernal	Uintah	
Maverik #142	490 W Main St	Vernal	Uintah	13-Mar-06
Mid-Town Tire & Auto	295 W Main St	Vernal	Uintah	02-May-01
Montgomery Brothers, Inc.	500 E Main St	Vernal	Uintah	04-Feb-94
Perry Motor Co., Inc.	463 E Main St	Vernal	Uintah	23-Sep-99
Premoco #37	850 W Highway 40	Vernal	Uintah	21-May-96
Pride Food Mart Vernal West	895 W Hwy 40	Vernal	Uintah	21-Apr-95
RDT Inc.	1281 East Hwy 40	Vernal	Uintah	05-Jul-06
Salina Investment Co. #26	615 W Main St	Vernal	Uintah	27-Mar-97

Location Name	Location Street	Location City	Location County	Date Closed
Schulz 66 (Old Phillips #007830)	216 E Main St	Vernal	Uintah	11-Jun-98
Texaco Station	332 W Main St	Vernal	Uintah	
Turner Lumber, Inc.	605 E Main St	Vernal	Uintah	11-May-95
Utah Motor Company	270 E Main St	Vernal	Uintah	03-May-95
Vernal Shop-N-Go	110 W Main St	Vernal	Uintah	19-Jun-06
Vernal Tri-Mart	206 W Main St	Vernal	Uintah	
Westside 66	508 W Main St	Vernal	Uintah	12-Jul-95
Segment 8				
B & L Conoco	U S Highway 40/ Utah 149	Jensen	Uintah	03-May-95
Preston Pit Stop/Old Service St.	N E Corner Hwy 40 & 149 West Of Jensen Bridge, Jensen	Jensen	Uintah	24-Jan-95

Note: some facilities may have more than one leaking UST or more than one closed leaking UST.

Source: DERR 2007

APPENDIX A:

Existing Facility Conditions Report

Existing Facility Conditions Report

in support of the
U.S. 40 Corridor Study

MP 21 in Wasatch County to MP 147 in Uintah County, Utah

Utah Department of Transportation

Project No. S-0040(65) 21

Prepared by
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October 2007

Tables

Figures

1.0 Introduction

This report provides a compilation of data for reference during development of the U.S. 40 Corridor Study. It provides the basis by which planning analyses will be completed and provides the framework for an understanding of current conditions along the corridor. This report also describes the role of the U.S. 40 corridor and the need for a long-term corridor plan.

The long-term plan will allow the Utah Department of Transportation (UDOT) to plan for corridor improvements in a manner that involves local stakeholders, residents of the area, business and industry interests, and agencies. The plan will identify strategies, action items, and priorities for transportation facility management and improvement of U.S. 40.

1.1 Corridor Study Area

The U.S. 40 Corridor Study area extends from MP 21 in Wasatch County, just east of the southeastern Heber City limit, to MP 157, near Jensen at State Route (SR) 149 (Figure 1-1). The 136-mile long corridor crosses three counties in Utah–Wasatch, Uintah[1], and Duchesne–and passes through a number of small rural towns and cities. These cities are important economic centers for residents living and working in the Uintah Basin. They also provide vital support of tourism, another important element of life in the Uintah Basin. The safe and efficient operation of U.S. 40 is of interest to residents of these cities and less developed outlying areas of the three counties.

For the purposes of the U.S. 40 Corridor Study, the project area is divided into eight segments based on general land use types. These segments are as follows:

Segment 1: Project Start (MP 21) to Daniels Summit (MP 34). This 13-mile-long segment travels through mostly undeveloped land in Wasatch County. Most land along the roadway is managed by the U.S. Forest Service (USFS).

[1] The word Uintah is spelled two different ways, depending upon the reference. Most spellings use *Uintah*, though Wasatch County and the U.S. Forest Service use the spelling *Uinta*, and the river by that name is the *Uinta* River.

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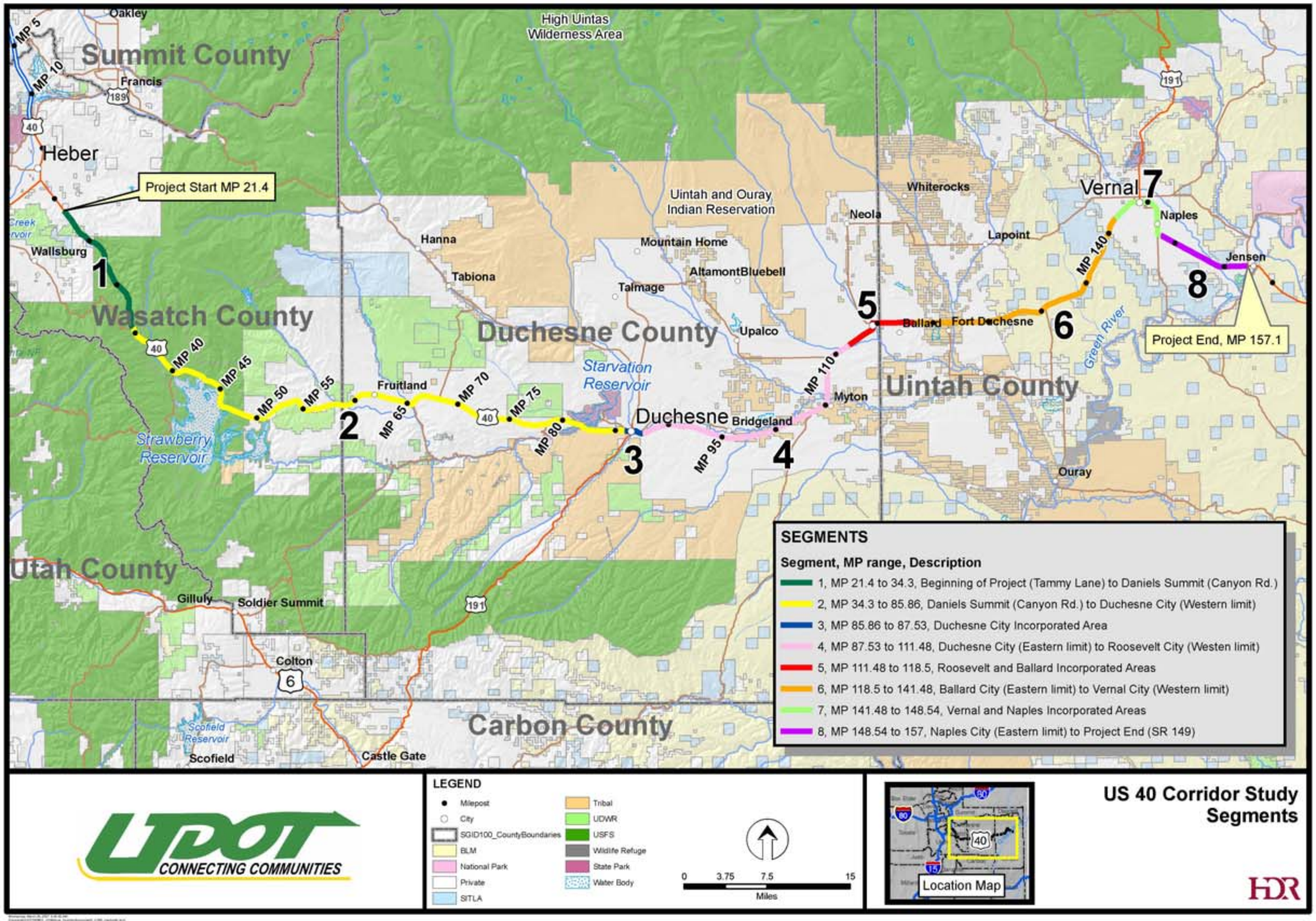
Figure 1-1. Project Segments



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Segment 2: Daniels Summit (MP 34) to the Western Duchesne City Limit (MP 86). This segment, which is 52 miles long, travels through mostly undeveloped land in Wasatch and Duchesne Counties. Most land between Daniels Summit and Strawberry Reservoir is managed by the U.S. Forest Service (USFS), though there is limited private recreational development around the reservoir. Between the eastern side of the reservoir and western Duchesne County, the corridor passes through state-owned land (wildlife management areas) and private land. Most of the land between the Wasatch/Duchesne county line and the city of Duchesne is privately owned, with the exception of land around Starvation Reservoir, which is managed as a State Park.

Segment 3: Incorporated Area of Duchesne City (MP 86 to MP 88). This two-mile-long segment in Duchesne County is comprised of that portion of the corridor within the Duchesne City limits. Development is typical of that found in rural towns. Land along the highway is dedicated primarily to commercial uses, though there is some residential and industrial development.

Segment 4: Eastern Limit of Duchesne (MP 88) to the Western Limit of Roosevelt (MP 112). This 24-mile-long segment covers an area dominated by private and tribal land. This area supports some agricultural production and limited oil and gas development. The segment is entirely within Duchesne County.

Segment 5: Roosevelt and Ballard Incorporated Areas (MP 112 to MP 119). This segment, which is seven miles long, encompasses the area within the incorporated limits of the cities of Roosevelt and Ballard. The Duchesne/Uintah County Line marks the political division between Roosevelt and Ballard, but the area functions as a single, more urbanized area. Development along U.S. 40 is dominated by commercial uses, though there is some residential development interspersed along the segment.

Segment 6: Eastern Limit of Ballard (MP 119) to the Western Limit of Vernal (MP 142). This 23-mile-long segment is characterized by tribal land and private land in the western half and Bureau of Land Management (BLM) and state-owned land in the eastern half. There is some oil and gas-related development along the highway, though most wells are south of U.S. 40 on tribal and BLM land. This segment is entirely within Uintah County.

Segment 7: Vernal and Naples Incorporated Areas (MP 142 to MP 149). This seven-mile-long segment is dominated by urban development normally associated with rural cities. Development immediately adjacent to the highway is characterized by commercial and industrial development, with limited residential development interspersed throughout.

Segment 8: Eastern Limit of Naples (MP 149) to Project End (MP 157). This segment, which is eight miles long, is mostly under private ownership and is characterized by rural residential and agricultural development. State-owned land that touches the highway just west of Jensen supports a limited number of oil and gas wells.

1.2 Contents of this Document

This document is comprised of five main sections:

- Existing Transportation System: a description of existing facility conditions for which information is available.
- Existing Operational Conditions: a summary of existing traffic volumes, level of service, accident data, and bicycle and pedestrian facilities.
- Existing Land Use Conditions and Demographics: a summary of land uses along the corridor and of population and housing conditions that may influence land use and future development.
- Literature Review: a review of how existing federal, state, and local plans address the U.S. 40 corridor.
- Issue Summary: a summary of issues identified by land owners and managers, regulators, and the general public.

A complete list of references is included in Section 6.0 of this report.

2.0 Existing Transportation System

The following summarizes the existing facility conditions of the U.S. 40 project corridor. In some cases, the information below focuses on the project segments described in Section 1.1. Information is also presented by milepost (MP).

2.1 Highway Geometrics

2.1.1 Terrain

Terrain type is a factor that greatly affects roadway conditions and ultimately how roadways operate. Roadway terrain is typically described as *level*, *rolling*, or *mountainous*. On level terrain, all types of vehicles can generally maintain the same speeds. On rolling terrain, the speeds of heavy vehicles (such as heavy trucks) can be substantially slower than those of passenger vehicles but are not so slow that heavy vehicles have to operate at "crawl" speed for long periods of time. Finally, mountainous terrain causes heavy vehicles to operate at crawl speeds for significant distances or frequent intervals (TRB 2000).

Specific information on highway grades along U.S. 40 is not readily available. In general, the highway traverses mountainous terrain with steep grades on the west end of the corridor through Daniels Canyon and more level and rolling terrain in the Uintah Basin. Truck climbing lanes occur around MP 43, MP 106 to MP 107, and MP 152 to MP153. Passing lanes, which may also serve as climbing lanes in some areas, are summarized under Section 2.1.3, Passing Opportunities, below.

Once projects are defined, specific information regarding grades can be gathered as part of each project.

2.1.2 Horizontal and Vertical Alignment

Roadway alignment is simply the path that a roadway's centerline follows. Alignment is thought of in horizontal and vertical planes. Factors that affect how an engineer thinks about alignment include:

- Horizontal Curves
    - Design speed
    - Length of curve
    - Roadway cross section

- Radius of curve
- Superelevation (or banking)
- Tangent-to-curve transition
- Lines of sight
- Profile
- Drainage
- Cost
- Compatibility with existing and proposed conditions (controls) along the path
- Vehicle characteristics
- Driver limitations

- Vertical Curves
  - Design speed
  - Vertical clearances
  - Sight distance
  - Topographical/terrain variations
  - Drainage considerations
  - Cost
  - Entrance considerations associated with acceleration and deceleration
  - Lengths of grades
  - Compatibility with grades and elevations existing on adjacent land and approaching roads and drives adjacent to the alignment

Horizontal alignment, combined with vertical alignment, serves as the primary controlling element associated with the design of all types of public streets and highways. Alignment affects roadway capacity, safety, and function.

A compilation of information on the existing horizontal and vertical alignment of U.S. 40 is not readily available. Historic as-built plans for the highway provide limited information about alignment, but the stationing (i.e., reference points) is different from the current milepost system. This makes a direct comparison between historic information and current conditions difficult and very time consuming. Existing alignment issues have been identified by people who use the highway on a regular basis, but UDOT maintenance station personnel, and by the road departments of local government agencies (see Section 5.0 of this document for a summary of issues identified to date). Once projects are identified, project-level analyses will provide detailed information about how the current horizontal and vertical alignments affect operation and how they might be changed to improve roadway conditions.

2.1.3 Passing Opportunities

Provision of passing sight distance on two-lane highways is another factor that affects roadway capacity. In order to permit passing on a two- lane highway, drivers must be able to see a sufficient distance to see oncoming vehicles and to execute a safe passing maneuver. The minimum recommended passing sight distance is directly related to the design speed of any given section of roadway. The American Association of State Highway and Transportation Officials (AASHTO) manual recommends a minimum of 2,285 feet for passing sight distance at a 65 miles per hour (mph) design speed (AASHTO 2004). According to the Roadway Design Manual of Instruction provided by UDOT (2006a), the required AASHTO passing sight distance may be shortened by using engineering judgment in locations where the lack of passing zones directly affects the roadway level of service (LOS). Table 2.1-1 below shows the percentage of the U.S. 40 corridor where some passing movement is allowed. This includes passing maneuvers into opposing travel lanes and current passing lanes that exist in either direction of travel.

Table 2.1-1. Percentage of the Corridor Where Passing is Allowed

Segment	% of Passing Allowed
1	92.9%
2	83.2%
3	82.6%
4	75.9%
5	85.5%
6	79.1%
7	81.9%
8	90.4%

Source: UDOT 2006b

U.S. 40 currently provides passing opportunities in the locations listed in Table 2.1-2

Table 2.1-2. Existing Passing Lanes on U.S. 40

Beginning MP	Length (Miles)	Direction[a]	Notes
23.34	7.09	EB	4% grade
31.29	3.23	EB	4% grade
35.11	0.53	WB	4% grade
42.97	0.34	EB	4% grade
45.88	1.96	EB	4% grade
48.83	0.36	EB	4% grade
50.62	0.41	EB	5% grade
58.34	11.19	WB	4 % to 5% grade
59.08	0.35	EB	5% grade
60.06	0.32	WB	No grade
61.60	0.16	WB	No grade
69.31	0.88	EB	3% grade
70.33	0.36	WB	No grade
80.76	6.81	WB	3% grade
85.88	0.92	EB	Inside Duchesne city limits (2 lanes)
86.80	3.47	WB	0.92 miles inside Duchesne (2 lanes) ; no grade
106.04	1.51	EB	0% grade
109.50	0.84	WB	4.5% grade
111.33	4.00	EB	Inside Roosevelt
115.41	4.08	WB	Inside Roosevelt (2 lanes)
118.79	0.90	EB	No grade
120.16	0.77	WB	3% grade
138.55	1.27	EB	4% grade
141.24	7.18	EB	Inside Vernal/Naples (2 lanes)
148.41	7.56	WB	Inside Vernal/Naples (2 lanes)

[a] EB = eastbound, WB = westbound

Source: UDOT 2006b

2.1.4 Right-of-Way Width

Right-of-way widths can vary significantly throughout the corridor, especially within the different city limits. UDOT does not have recommended right-of-way widths for rural highways such as U.S. 40. Table 2.1-3 shows the average right-of-way by segment.

Table 2.1-3. Average Right-of-Way Width by Segment

Segment	Average Right-of-Way Width (feet) [a]
1	133
2	232
3	168
4	137
5	97
6	256
7	113
8	108

[a] Width calculated using weighted average of sections of roadway for which specific ROW widths are available, by segment.

Source: UDOT 2004a

2.1.5 Lane and Shoulder Width

The entire U.S. 40 corridor has 12-foot travel lanes, which is the recommended width by AASHTO for rural highways. The U.S. 40 corridor also contains several areas of medians, right-hand turn lanes, and acceleration lanes. These median, turn, and acceleration lanes are assumed to be a width of 12 feet. In the urban areas (Segments 3, 5, and 7), a median is typical through the city limits. Shoulder widths are the narrowest (0 to 1.9 feet wide) over Daniels Summit and through the City of Vernal. Narrow sections measuring 2 to 4 feet occur near Strawberry Reservoir and Fruitland in Segment 2 and between the eastern limit of Naples to Jensen in Segment 8 (UDOT 2004b).

Shoulder width on rural highways is directly related to traffic demands. AASHTO recommends a usable shoulder width of 8 feet for design volumes over 2000 vehicles per day. Usable shoulders should be paved, but due to economic constraints, low volumes, and/or where narrow sections are needed to reduce construction impacts, the paved shoulder may be reduced to 2 feet. When barriers or guardrail must be used to protect from roadside features, AASHTO recommends a minimum of 4 feet from the traveled way to the barrier if a narrow section is needed due to construction impacts. Based on what is shown in the U.S. 40 video log, the existing shoulder widths appear to meet AASHTO standards. However, information provided on UDOT's Utah Bicycle Suitability Map (UDOT 2004b) conflicts with this information and shows that there are some areas where the shoulder does not meet AASHTO standards. Future project-level analyses will need to review shoulder widths on the ground and address any issues associated with inadequate shoulder widths.

2.1.6 Access Management

Access standards and management greatly affect the safety and operation of rural highways such as U.S. 40, especially where the highway intersects developed cities and towns. Table 2.1-4 outlines UDOT's proposed statewide access management standards (standards have not yet been finalized by UDOT). According to the access category inventory for UDOT Region 3, which includes the U.S. 40 corridor, most of the project corridor is classified as *System Priority Rural*. The classification changes briefly through the more urbanized areas of Duchesne, Myton, Roosevelt, and Vernal-Naples as follows:

- Duchesne (all of Segment 3) and Roosevelt (in Segment 5): Regional Rural and Community Rural
- Myton (in Segment 4): Regional Rural
- Vernal and Naples (Segment 7): five different classifications depending on location within the cities, including Regional Rural, System Priority Urban, Regional Priority Urban, Regional Urban, and Community Rural

Table 2.1-4. Proposed State Highway Access Management Standards

Category		Minimum Signal Spacing (feet)	Minimum Street Spacing (feet)	Minimum Access Spacing (feet)	Minimum Interchange to Cross Road Access Spacing (feet)		
					A: to 1st R-in R-out[a]	B: to 1st Intersection[b]	C: from Last R-in R-out[c]
1	Interstate/ Freeway	Freeway/Interstate Standards Apply					
2	System Priority Rural	5,280	1,000	1,000	1,320	1,320	1,320
3	System Priority Urban	2,640	No Unsignalized Access Permitted		1,320	1,320	1,320
4	Regional Rural	2,640	660	500	660	1,320	500
5	Regional - Priority Urban	2,640	660	350	660	1,320	500
6	Regional Urban	1,320	350	200	500	1,320	500
7	Community Rural	1,320	300	150	NA	NA	NA
8	Community Urban	1,320	300	150	NA	NA	NA
9	Other	1,320	300	150	NA	NA	NA

[a] Standard "A" distance from the interchange off-ramp gore area to the first right-in/out driveway intersection.

[b] Standard "B" refers to the distance from the interchange off-ramp gore area to the first major intersection.

[c] Standard "C" refers to the distance from the last right-in/out driveway intersection to the interchange on-ramp gore areas.

Source: UDOT 2003

2.2 Structural Conditions

2.2.1 Pavement Condition

UDOT determines pavement condition by using the skid number, IRI HCS (international roughness index half car simulation) number, and rut depth. The classifications for each of the values are directly related to corresponding range for that number. These ranges are shown in the Table 2.2-1.

Table 2.2-1. Pavement Ratings and Ranges

Rating Type	Classification
Skid Number	
SN > 45	Standard
30 > SN > 45	Marginal
SN < 30	Substandard
IRI HCS	
IRI < 45	Very Good
45 < IRI < 70	Good
70 < IRI < 100	Fair
100 < IRI < 135	Poor
IRI >135	Very Poor
Rut Depth (inches)	
R < 0.1	Very Good
0.1 < R < 0.25	Good
0.25 < R < 0.50	Fair
0.50 < R < 0.75	Poor
R > 0.75	Very Poor

Source: UDOT 2001

By using the ranges specified in Table 2.2-1, the overall pavement condition can be determined. All of the segments along the U.S. 40 project corridor are in good or fair condition (see Table 2.2-2). This was determined by taking the average values for each segment. However, because each segment's condition was taken as an average, there might be a few miles within each that could be classified as poor. Such poor conditions are notable at MPs 115, 116, 148 and 150.

Table 2.2-2. Pavement Condition of the U.S. 40 Corridor

Segment	Average Skid Number	Average IRI HCS	Average Rut Depth (inches)	Pavement Condition
1	38.7	68.8	0.11	Good
2	39.3	63.7	0.15	Good
3	40.2	70.5	0.15	Fair
4	38.8	63.4	0.11	Good
5	34.6	95.9	0.16	Fair
6	29.1	53.3	0.11	Good
7	25.2	81.8	0.22	Fair
8	30.9	60.7	0.12	Good

Source: UDOT 2006c

Recent Projects

Appendix A summarizes recent and planned road improvement (maintenance) projects along the project corridor. The planned maintenance projects indirectly provide additional information about existing pavement condition.

2.2.2 Drainage

For the majority of U.S. 40, drainage occurs as sheet flow off of the roadway into either roadside ditches or into natural drainage features. However, in some of the cities, there are closed drainage systems where the water is collected by curb and gutter. Detailed drainage sufficiency information is not readily available, but local residents and UDOT maintenance personnel have stated that drainage along some portions of the highways in the more developed areas is inadequate due to the road level surface being higher than the adjacent curb (HDR 2007a; KMP Planning 2007a, 2007b).

2.2.3 Bridge Conditions

In the state of Utah, bridges are assigned sufficiency ratings ranging from 0 to 100. These values are used to determine eligibility for bridge replacement and rehabilitation needs. Bridge sufficiency ratings are based on a bridge's structural adequacy, compliance with current design standards, importance for public use, and eligibility for federal bridge replacement funds. Bridge sufficiency ratings below 50 indicate that the bridge should be replaced. Ratings between 50 and 80 imply that the bridge is in fair condition and that rehabilitation, if cost-effective, should be considered. Bridges with ratings of 80 or higher are in good or very good condition and are not eligible for federal funding through the Highway Bridge Rehabilitation and Replacement (HBRR) Program.

Appendix B lists the conditions of the 22 bridges along the project corridor. Currently, only two bridges are in poor condition (rated below 50) and four are in fair condition (rated between 50 and 80).

2.3 Traffic Conditions

2.3.1 Capacity and Level of Service

Methodology

Highway Segment Analysis

Methodologies consistent with the Transportation Research Board's (TRB) *Highway Capacity Manual 2000* (HCM) were used to assess the existing capacity and LOS conditions along the U.S. 40 project corridor. LOS is a quality measure that describes operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience (TRB 2000). TRB generally describes five levels of service as:

- A: Free flow
- B: Reasonably free flow
- C: Stable flow
- D: Approaching unstable flow
- E: Unstable flow
- F: Forced or breakdown flow

The highway segment analysis was completed using the two-lane analysis module of the Highway Capacity Software (HCS). Traffic counts conducted at various locations along the U.S. 40 corridor and served as the base traffic count information (L2 Data Collection 2007; UDOT 2007c).

A monthly variance factor derived from a UDOT permanent traffic count site near MP 111 was used to show seasonal variations in traffic (UDOT 2005a). This factor was used to adjust the base traffic count information to provide an estimate of an average traffic flow condition. Truck information was determined from UDOT's classification counts conducted along U.S. 40.

In general, speed limits in the survey area vary from 55 mph to 65 mph in the two-lane segments. At locations where passing lanes were not provided, the percent no-passing zone was a key input to determining the existing level of service (LOS; see Section 2.1.3, Passing Opportunities, for more information about passing limitations).

Currently, the HCM classifies two-lane highways as *Class I* and *Class II*. Class I highways are two-lane highways on which motorists expect to travel at relatively high speeds and are usually primary arterial roadways that connect major traffic generators or provide primary links in the state or national highway networks. Class II highways are also two-lane but function primarily as access routes to Class I highways, serve as scenic or recreational routes that are not primary arterial roadways, pass through very rugged terrain, and usually serve relatively short trips.

The highway classification establishes the measures of effectiveness that are used to determine the LOS along U.S. 40. U.S. 40, which is a two-lane highway throughout much of its length, meets the definition of a Class I highway due to its function as a primary state highway that generally supports faster-moving traffic. For Class I highways, LOS is determined using percent time spent following and average travel speed; these indicators are generally related to how the traveling public measures performance along a two lane roadway. The analysis was applied to areas outside the limits of urban locales where multiple lanes occur and included consideration of existing passing lanes along the corridor. Table 2.3-1 shows the thresholds used to determine LOS along two-lane highways.

Table 2.3-1. 2000 Highway Capacity Manual Roadway Segment LOS Thresholds

LOS	Percent Time Spent Following	Average Travel Speed (mph)
A	< 35	> 55
B	> 35-50	> 50-55
C	> 50-65	> 45-50
D	> 65-80	> 40-45
E	> 80	< 40

Source: TRB 2000

Table 2.3-2 summarizes the data used for the existing conditions highway segment analysis.

Table 2.3-2. Inputs for the U.S. 40 Corridor Study HCS Analysis

Segment	Begin MP	End MP	Section Length (miles)	Shoulder Width (ft)	Year Volume	2007 % Truck	% No Passing Zone
1	21.4	35.64	14.24	4	3213	21	93
2	35.64	42.97	7.33	4	3213	21	83
3	42.97	58.34	15.37	4	2956	21	83
4	58.34	72.33	13.99	4	3291	21	83
5	72.33	85.86	13.53	4	3291	21	83
6	86.81	104.57	17.76	4	4471	21	83
7	105.56	110.34	4.78	4	6049	21	76
8	115.2	116.62	1.42	4	7856	21	86
9	116.62	120.34	3.72	4	11055	21	79
10	121.9	137.55	15.65	4	8244	21	79
11	137.55	139.83	2.28	4	11919	21	79
12	149.94	157.1	7.16	4	9878	21	86

Source: UDOT 2005a, 2005b, 2006b, 2007c

Signalized Section Analysis

The performance assessment of urban sections along U.S. 40 through Vernal and Roosevelt was analyzed to develop a baseline of existing traffic conditions. Information from traffic signal intersections were coded into Synchro, a widely used traffic signal evaluation tool.

In addition to defining LOS as being at a level of A (free flow) through F (forced or breakdown flow), the HCM defines LOS at intersections as a function of the average overall wait time for a vehicle to pass through an intersection. This way, LOS can be quantitatively measured at any intersection providing a performance measurement for the corridor. Table 2.3-3 lists the intersection LOS thresholds.

Table 2.3-3. Highway Capacity Manual Intersection LOS Thresholds

LOS	Intersection Delay (seconds)
A	0 to 10
B	10 to 20
C	20 to 35
D	35 to 55
E	55 to 80
F	> 80

Source: TRB 2000

Manual turning movement traffic counts were conducted at most signalized intersections along the U.S. 40 project corridor (L2 Data Collection 2007). These counts were completed during the morning and evening commute periods when traffic was at its peak. Once the peak hour condition (heaviest traffic flow) was determined, the data were entered into Synchro. In Roosevelt, counts were not conducted for the morning (AM) peak period or for one intersection (200 East) during the evening (PM) peak period (the 200 East intersection evening traffic was balanced on U.S. 40 for traffic entering from adjacent intersection then other movements were adjusted based on similar movements at adjacent intersection). To determine the AM peak traffic condition in Roosevelt, a reverse percentage flow from the PM peak period along this corridor was applied. An average percentage difference calculated from all intersections in Vernal was used to adjust for the difference in morning versus evening. Additional count data collected for a different project in Vernal were also considered in the analysis (DMJM Harris-AECOM 2007).

Results

Highway Segments

The LOS for each roadway segment of U.S. 40 is based on the two-way design hourly volumes and, where presented, the impact that passing lanes have on a directional basis within a specific roadway segment. The segments presented in this analysis are different from the corridor segments identified in Section 1.1, Corridor Study Area.

In general, the existing LOS along the U.S. 40 corridor is LOS D or better, except for one segment just outside of the Vernal-Naples urban area, which is shown in Table 2.3-4 and Table 2.3-5. The calculated average travel speed ranged from 36 mph to 59 mph, with most segments in the low- to mid-50 mph range. The HCS analysis estimated the existing percent time spent following at 24% to 73%, with most segments in the 30% to 40% range. Both average travel speed and percent time spent following were negatively affected in areas where no passing lanes exist or just outside of urban areas along the corridor. UDOT recognizes the region’s growing transportation needs in its current long-range plan and has identified projects to address these issues, including additional or extended passing lanes and enhanced transportation facilities (such as turn pockets) in smaller to mid-sized urban areas.

Table 2.3-4. Two Way HCS Analysis for the U.S. 40 Project Corridor, AM Peak Period

LOS Analysis Segment	Begin MP	End MP	Section Length (miles)	Volume EB/WB	LOS	Average Speed (mph)	% Time Spent Following
1	21.4	35.64	14.24	131/111	A	59.1	25.5
2	35.64	42.97	7.33	131/111	C	53.9	54.1
3	42.97	58.34	15.37	114/108	A	59.7	24.4
4	58.34	72.33	13.99	114/108	A	55.5	32
5	72.33	85.86	13.53	129/125	A	58	27.1
6	86.81	104.57	17.76	164/133	D	44.4	58.1
7	105.56	110.34	4.78	265/261	B	55.5	42.9
8	115.2	116.62	1.42	265/261	E	37.7	63.8
9	116.62	120.34	3.72	351/324	C	49.1	54.8
10	121.9	137.55	15.65	230/281	C	47	63
11	137.55	139.83	2.28	395/310	C	54.4	57
12	149.94	157.1	7.16	369/324	D	51.3	69.8

Table 2.3-5. Two Way HCS Analysis for the U.S. 40 Project Corridor, PM Peak Period

LOS Analysis Segment	Begin MP	End MP	Section Length (miles)	Volume EB/WB	LOS	Average Speed (mph)	% Time Spent Following
1	21.4	35.64	14.24	123/129	A	57.8	26.9
2	35.64	42.97	7.33	123/129	C	53.8	55.4
3	42.97	58.34	15.37	113/112	A	59.9	24.5
4	58.34	72.33	13.99	113/112	A	55.9	30.4
5	72.33	85.86	13.53	122/130	A	58.1	26.3
6	86.81	104.57	17.76	169/190	D	44	56.6
7	105.56	110.34	4.78	348/327	C	54.9	50.2
8	115.2	116.62	1.42	348/327	E	36.5	69
9	116.62	120.34	3.72	483/446	C	47.7	63.8
10	121.9	137.55	15.65	282/344	D	47	66.9
11	137.55	139.83	2.28	560/448	D	52.2	68.2
12	149.94	157.1	7.16	354/448	D	51.2	73.3

Signalized Sections

Table 2.3-6, Table 2.3-7, Table 2.3-8, and Table 2.3-9 summarize the existing LOS in the Roosevelt-Ballard and Vernal-Naples urban areas. These tables show that all intersections in Roosevelt are operating at LOS C or better. Intersections located in Vernal have peak periods of LOS D through F. The PM peak periods generally experience greater delays due to the higher traffic volumes.

Table 2.3-6. U.S. 40 Roosevelt Traffic Signal System, AM Peak Period

	U.S. 40		Cross Street		Overall Intersection Delay (seconds)	Overall Intersection LOS
	EB	WB	NB	SB		
State Street						
Delay[1]	1.9	0.4	29.5	29.6	4.2	A
LOS	A	A	C	C		
Lagoon Street						
Delay	7.8	7.7	17.1	13.3	13.1	B
LOS	A	A	B	B		
200 East Street						
Delay	26	21.1	8.7	15.8	17.4	B
LOS	C	C	A	B		
N 600 East						
Delay	2.2	2.9	26.9	26.9	6.3	A
LOS	A	A	C	C		

[1] Delay is in seconds.

Table 2.3-7. U.S. 40 Roosevelt Traffic Signal System, PM Peak Period

	U.S. 40		Cross Street		Overall Intersection Delay (seconds)	Overall Intersection LOS
	EB	WB	NB	SB		
State Street						
Delay[1]	2.5	2.3	30.4	30.7	5.7	A
LOS	A	A	C	C		
Lagoon Street						
Delay	9.5	9.5	18	18.3	15.7	B
LOS	A	A	B	B		
200 East Street						
Delay	33.1	29.8	24.8	26.9	28.5	C
LOS	C	C	C	C		
N 600 East						
Delay	3.4	3.5	28.7	28.8	7.4	A
LOS	A	A	C	C		

[1] Delay is in seconds.

Table 2.3-8. U.S. 40 Vernal Traffic Signal System, AM Peak Period

	U.S. 40		Cross Street		Overall Intersection Delay (seconds)	Overall Intersection LOS
	EB	WB	NB	SB		
100 South						
Delay	19.3	18.5	56.5	24.3	27.2	C
LOS	B	B	E	C		
500 West						
Delay	5.2	2.6	26.7	30.3	7.6	A
LOS	A	A	C	C		
100 West						
Delay	1.1	1.5	34.9	34.7	3.6	A
LOS	A	A	C	C		
US 191						
Delay	3.5	5.4	24.1	27.1	10.2	B
LOS	A	A	C	C		
500 East						
Delay	2.7	3	33.1	33.5	8.0	A
LOS	A	A	C	C		

[1] Delay is in seconds.

Table 2.3-9. U.S. 40 Vernal Traffic Signal System, PM Peak Period

Intersection	U.S. 40		Cross Street		Overall Intersection Delay (seconds)	Overall Intersection LOS
	EB	WB	NB	SB		
100 South						
Delay[1]	34	50.6	86.7	22.9	46.2	D
LOS	C	D	E	D		
500 West						
Delay	14.5	38.5	63	35.4	33.6	C
LOS	B	D	E	D		
100 West						
Delay	1.2	2.8	44.2	41	5.7	A
LOS	A	A	D	D		
US 191						
Delay	164.8	7.6	112.8	32.5	74.1	E
LOS	F	A	F	C		
500 East						
Delay	5.9	11.3	36.3	46.2	15.5	B
LOS	A	B	D	D		

[1] Delay is in seconds.

2.3.2 Accident History

One of the most fundamental ways that transportation investments can enhance quality of life is by making it possible for people to move around in relative safety. While it will never be possible to remove all risk involved in moving people or goods, it is an important public policy objective to identify particularly high-risk circumstances and address them as comprehensively as possible.

Improving highway safety requires consideration of the three elements influencing traffic operations: the driver, the vehicle, and the roadway. Although traffic engineers have effective control over only one of these elements—the roadway—from the planning perspective, policies could be implemented to address better information outreach and behavior. Traffic safety can be approached in a number of different ways: reducing crash occurrences, reducing the severity of crash, improving crash survivability, enforcing safety control efforts and improving design aspects of the road. Both physical alterations and social policies should be considered to enhance safety in the corridor.

HDR completed a complete analysis of existing crash data for the U.S. 40 corridor study project area (HDR 2007a). That technical memorandum presents an analysis of five years of crash data obtained from the UDOT Office of Traffic and Safety (UDOT 2007d). The following summarizes the findings of that analysis. For complete information, see the separate U.S. 40 Corridor Study Crash History and Analysis (HDR 2007a).

Methodology

The UDOT crash database from the Office of Traffic and Safety provides a variety of information about each reported crash. In some instances, not all information is provided for each crash in each location. Information about each individual crash is provided by the police officers called to the scene and depends on the specifics of each report. The information included in an accident report generally includes:

- Location by milepost (as estimated by reporting officer)
- Crash severity and number of fatalities and injuries
- Number and type of vehicles
- Drivers action for each vehicle involved
- Type of collision

- Location in relation to intersection and roadway
- Contributing circumstances
- Weather, roadway surface, and light conditions
- Day-of-week, hour-of-day, and date of crash

Crash data were obtained for the years 2001 through 2005. The analysis first reviewed general accident statistics, including crash history, accident rates, accident severity, and related costs. The data were then reviewed more closely for information regarding accident frequency and location, relationship to roadway intersections (junctions), time of year (month), number of vehicles involved, roadway surface condition, type of vehicle involved, type of collision, and type of accident. Finally, reviewers examined information about driver age and contributing circumstances.

Summary of Findings

Analysis of the available data resulted in the following findings:

- The number of crashes increased significantly since 2003 (that is, over 2001 through 2003 numbers).
- The crash rate was above the statewide average for the rural sections of the corridor for the last three years of the study.
- The majority of the crashes (84%) occurred on a dry roadway surface.
- Failure to yield right-of-way (16%), improper lookout (15%), and maintaining too fast a speed (15%) were the three main contributing circumstances.
- *Collision with a moving vehicle* was the most frequent crash occurrence (40%) and the most frequent fatal crash occurrence (73%).
- Wild animals were involved in 32% of crashes in the study corridor. Wild-animal-related incidents were not clustered in one particular area, but occurred regularly throughout the corridor. The actual number of these types of accidents may actually be higher since many collisions involving motor vehicles and wild animals are not reported.
- After maintaining too fast a speed (17%), failure to yield (11%) was the most common contributing circumstance to fatal crashes.
- Only one out of every four crashes was at an intersection or was intersection related.

- Young drivers (ages 15 to 19) constitute a disproportionately high percentage of all drivers involved in crashes in the corridor. Drivers in this age group were involved in 16% of the crashes in the study corridor.

2.4 Bicycle and Pedestrian Facilities

Due to its rural nature, U.S. 40 does not have formal bike lanes or bikeways. The project segments that travel through more urbanized areas (Segments 3, 5, and 7) have sections of sidewalk available for pedestrian use. Bicycle use of existing shoulders and crossings is also more prevalent in these areas. Segment 5, which includes Roosevelt and Ballard, is crossed by a greenbelt that is used by cyclists and pedestrians.

The bicycle/motor vehicle crash rates of all counties along the corridor are lower than the state average (see Table 2.4-1, Bicycle and Pedestrian/Motor Vehicle Crash Rates 1995–2004). Recreational cyclists traveling long distances ride along the shoulders of U.S. 40. According to the Utah Bicycle Suitability map (UDOT 2004), most sections of the highway outside of the city limits provide a shoulder width of more than four feet. Two to four-foot wide shoulders are present near Strawberry Reservoir (about MP 45 through MP 50), the intersection of U.S. 40 and SR 208 (about MP 68), and between Naples and Jensen (about MP 148 to MP 157). The bicycle suitability maps indicates that U.S. 40 has shoulders less than two-feet-wide over Daniels Summit and through the city of Vernal, though the U.S. 40 video log shows that such narrow shoulders are not consistently present in those areas (see Section 2.1.5, Lane and Shoulder Width). As shown in Table 2.4-1, Bicycle and Pedestrian/Motor Vehicle Crash Rates 1995–2004, the pedestrian/motor vehicle crash rates for the three counties along the corridor are also lower than the state average.

Table 2.4-1. Bicycle and Pedestrian/Motor Vehicle Crash Rates 1995–2004

Location	Rate[a]	Statewide Ranking
Bicycle/Motor Vehicle Crashes		
Statewide	39.15	NA
Wasatch County	23.30	9
Duchesne County	13.21	22
Uintah County	21.33	14
Pedestrian/Motor Vehicle Crashes		
Statewide	48.24	NA
Wasatch County	27.18	14
Duchesne County	26.86	15
Uintah County	25.73	17

[a] Rate is number per 100,000 people

Source: Utah Department of Health 2006

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3.0 Existing Land Use Conditions and Demographics

3.1 Land Use

Operation of the U.S. 40 corridor is influenced by existing land uses. Future or planned land uses will also affect how the highway functions and might contribute to future roadway improvement needs. The following is a summary of existing and planned land uses along the U.S. 40 project corridor. More detailed information about land use along the project corridor is available in the U.S. 40 Land use Inventory technical report (HDR 2007b).

3.1.1 General Land Use Characteristics

Most of the land in the three counties through which the project corridor passes (Wasatch, Duchesne, and Uintah Counties) is publicly owned (Figure 3-1). However, as shown in Table 3.1-1, most of the land along the highway is privately owned. These statistics indicate that private landowners very likely access their land using U.S. 40 and its connecting roads.

Table 3.1-1. Land Ownership along U.S. 40

Owner / Administrator	Acres	Percent of Total
Federal agencies	41,514.38	23.63%
U.S. Forest Service	27,668.03	15.75%
Bureau of Land Management	13,846.35	7.88%
State agencies	14,832.25	8.44%
Trust Lands	5,119.33	2.91%
Parks	2,463.02	1.40%
Division of Wildlife Resources	7,249.90	4.13%
Ute Tribe	12,972.97	7.39%
Other	106,300.80	60.52%
Private	103,658.31	59.02%
Water bodies	2,642.49	1.50%

Source: USU 2006

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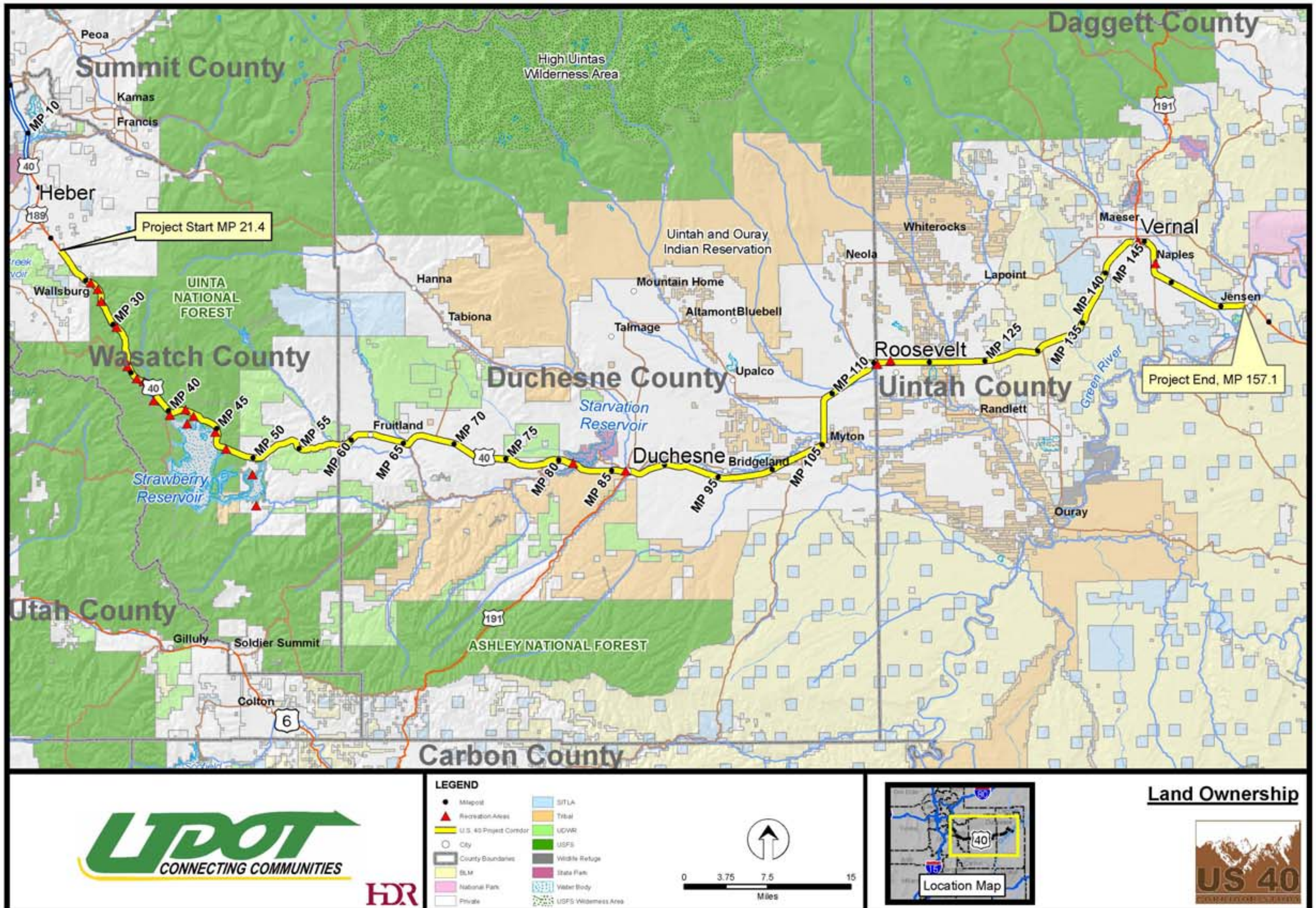
Figure 3-1. Land Ownership



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There are six incorporated cities situated next to U.S. 40 in the project area: Duchesne, Myton, and Roosevelt in Duchesne County and Ballard, Vernal, and Naples in Uintah County. There are a number of other towns and settlements along or near the corridor as well, including Fruitland, Fort Duchesne, and Jensen. For the most part, these towns rely on the larger population centers for goods and services, though some services are available in each settlement.

3.1.2 Local Government Agencies

Wasatch County Land Use

Wasatch County is the westernmost county on the project corridor. Its western boundary is about 40 miles east of Salt Lake City, the proximity of which greatly affects population and employment in the county. Most people who live in Wasatch County drive west to go to work in Park City and even the Salt Lake Valley. The year-round population and irrigated farmlands are concentrated in the Heber and Round Valleys, which are outside (west) of the project area. Strawberry Valley, which is along the project corridor to the east of Daniels Summit, supports a seasonal (summer) population focused on Strawberry Reservoir.

Future land use and planning for Wasatch County is detailed in the Wasatch County General Plan (Wasatch County Planning Commission 2001). Most land along U.S. 40 is administered by the USFS, though there is some Utah Division of Wildlife Resources land west of the reservoir (see Land Ownership figure on the following page). Privately held lands are concentrated near Strawberry Reservoir. The BLM administers a small piece of land at the western edge of the project corridor (Wasatch County Planning Commission 2001; SITLA 2007a). There are no incorporated cities along the project corridor in Wasatch County.

The Wasatch County General Plan includes a 20-year transportation improvement program, which is correlated with expected land use patterns over the same time period. The transportation improvement program does not identify any improvements to U.S. 40 in the project area. The recommended classification for U.S. 40 from Heber east to the Wasatch–Duchesne County line is Arterial, which is described in the General Plan as needing to "have right-of-ways that include adequate space for the roadway, trails, and green space." Further, the General Plan states that driveway access to arterial roads should be discouraged and that access should be limited to street intersections (Wasatch County Planning Commission 2001).

Duchesne County Land Use

The U.S. 40 corridor traverses the width of Duchesne County, a road distance of about 57 miles. The highway passes through three incorporated cities: Duchesne, Myton, and Roosevelt.

Like Wasatch County, most land in Duchesne County is publicly owned, though the majority of land along U.S. 40 is privately owned (Duchesne County 1997; SITLA 2007b). Starvation State Park, home to Starvation Reservoir, is situated on U.S. 40 just west of the city of Duchesne. SR 191, a major highway linking the Uintah Basin with areas to the south, intersects U.S. 40 in the city of Duchesne. Tribal lands are scattered along the U.S. 40 corridor, though there is a contiguous area of tribal land adjacent to the highway between Starvation State Park and the city of Duchesne.

The Duchesne County Plan, completed in 1997 and amended in 1998 and 2005, describes county policies, objectives, and action steps to guide the county's future. The plan does not specify a timeframe and does not include a transportation plan but does include policies that address access to and across public lands. The county's transportation system map is incorporated into the general plan by reference.

According to the County zoning map (Duchesne County, no date), private land along the U.S. 40 corridor is mostly rural residential and agricultural, though there are pockets of denser residential and commercial development outside the cities. The area around Fruitland (about MP 62) is designated for commercial uses, as is the area where SR 208 intersects U.S. 40 (about MP 68) and an area north of the highway just east of Starvation Reservoir (about MP 83). A long commercial corridor begins just northeast of the city of Myton and continues to the city limit of Roosevelt. Land identified for residential development (one dwelling unit per 2.5 acres) is concentrated just west of Fruitland, around the city of Duchesne, and along the highway just north of Myton. Industrial uses are located just north of the city of Duchesne, just north of Myton, and just southwest of Roosevelt. Land uses associated with the incorporated cities are discussed below.

Duchesne

Not to be confused with the community of Fort Duchesne in Uintah County, the city of Duchesne is the westernmost incorporated city in the study area. The city is the seat of Duchesne County and is located at the intersection of U.S. 40 and SR 191, the major route into the Uintah Basin from the south (SR 191 and

U.S. 40 are the same roadway from Duchesne to Vernal about 60 miles to the east).

U.S. 40 is also known as Main Street in Duchesne. On its land use map, the City designates all land along the highway as Commercial except for a short section on the eastern edge of the city along U.S. 40 that is identified as Residential-Agriculture (suitable for rural residential development). In general, residential land south of the highway is designated for rural residential use, while residential land north of the highway is identified for more traditional residential use as well as rural residential use. There is an area of the very eastern city limit south of U.S. 40 that is designated for Industrial use. There is a large area of tribal land south of the city along the SR 191 corridor.

Myton

Myton is the smallest incorporated city in the study area (population 539 in 2000 [U.S. Census Bureau 2000]). It is situated about 18 miles east of the city of Duchesne on the Duchesne River. Much of the land around Myton is tribal land. Land use in Myton is dominated by rural residential development and agricultural support activities.

Roosevelt

Roosevelt is the largest city in Duchesne County. The city center is located about 28 miles east of Myton and one mile west of the Duchesne County-Uintah County line at the intersection of SR 121 and U.S. 40. Roosevelt serves as the commercial center for the nearby small towns and settlements in both counties, including the nearby settlements of Ballard (population 566 in 2000 [U.S. Census Bureau 2000]) and Fort Duchesne (population 621 in 2000 [U.S. Census Bureau 2000]) in Uintah County.

According to the Roosevelt City Planner, most land in the city limits and adjacent to U.S. 40 is identified for commercial and industrial uses (Eschler 2007). The city's zoning map assigns a Commercial/Light Manufacturing designation to land along the highway between the southwestern city limit and about 800 South. The city's industrial park, which is located near the southwestern city limit, is accessed from U.S. 40. North of 800 South, the Commercial/Light Manufacturing zone continues on the west side of the highway to about 400 South, and land on the east side of the highway is designated as Commercial-Selling. The remainder of the highway corridor through the city maintains the Commercial-Selling designation. Residential land is evenly dispersed on either side of the highway throughout the city, with densities decreasing with distance from the highway. There is very little agricultural land within the city limits; what is present is situated on the city's boundaries, where it abuts land under the jurisdiction of the counties. There are several state-owned parcels just outside the city's boundaries.

Uintah County Land Use

Uintah County is the easternmost county in Utah along U.S. 40. The highway measures 60 miles from the Duchesne County-Uintah County line to the Utah-Colorado border, though the project corridor extends only about 42 miles from the county line to the community of Jensen near the intersection of U.S. 40 and S.R. 129. This intersection is the "gateway" to the Dinosaur National Monument, a major tourist destination.

As in Wasatch and Duchesne Counties, most of the land in Uintah County is publicly owned. Ownership along U.S. 40 is a mixture of public (state and federal), tribal, and private land, with most of the private land being concentrated in and around the cities of Vernal and Naples. Ute tribal land along the highway is concentrated in the western part of the county near the tribal headquarters of Fort Duchesne, where tribal land is intermixed with private land. BLM-administered land is concentrated along a 10-mile stretch of U.S. 40 west of Vernal, an area that also contains a concentration of state trust lands. Most land east of Vernal and Naples is privately owned, though there is a limited amount of state trust and BLM-administered land in this area.

Uintah County completed a General Plan update in 2005 Uintah County 2005a). The land use and transportation system maps were adopted after the plan was adopted but are still considered part of the General Plan. The land use map primarily assigns the less-developed portions of the corridor the Agriculture (western and eastern ends of the project corridor) and Mining and Grazing designations. The map shows limited amounts of commercially designated land associated with the unincorporated communities of Fort Duchesne and Jensen. Land uses associated with the incorporated cities are discussed below.

The 2006 Uintah County Transportation System Map (Uintah County 2005b) simply shows U.S. 40 as a state or federal highway. Though the General Plan policies do not address U.S. 40 specifically, the County does have guidance for access to and from county roads, including county approval of any new public or private access.

Ballard

Ballard is the westernmost city in Uintah County on U.S. 40. Ballard abuts Roosevelt in Uintah County and is very close to the community of Fort Duchesne.

Land that abuts U.S. 40 in Ballard is zoned for commercial use. Industrial land is concentrated on the eastern end of the city, with most industrial land occurring north of U.S. 40. Rural residential development is evenly distributed north and south of the highway and is concentrated in the western two-thirds of the incorporated area. Land on the far north and south ends of the city is zoned for agricultural use. The Ballard city offices are off the highway in the southern part of this small city at the intersection of 1000 South and 2500 East.

Vernal

Vernal, the seat of Uintah County, is about 30 miles east of Roosevelt. The city is an important regional center for the oil and gas industries and for recreation. SR 191 splits from U.S. 40 in Vernal and provides a connection to the Flaming Gorge National Recreation Area.

Land in Vernal and along the U.S. 40 corridor is primarily zoned for commercial and industrial uses. Between the western city limit and about 100 South, most of the land is identified as Planned Commercial. There are pockets of residential agricultural land at about 2100 South and at the intersection of U.S. 40 and 1500 West. Some residential parcels are situated near the intersection of U.S. 40 and Canal Road, and the land on which the Vernal Middle Schools sits southeast of the intersection of U.S. 40 and 100 South is identified as residential. North of 100 North, U.S. 40 turns to the east. Land in this area, which is the heart of downtown Vernal, is zoned as Central Commercial with the exception of Kiwanis Park, which is zoned for use as a park. The city offices are located in this part of the city at 100 East. Commercial zoning continues until about 800 East, where the zoning changes to Industrial. The land between this point and the eastern city limit maintains the Industrial zoning.

Naples

Naples is a small city about two miles southeast of Vernal. Like Vernal, commerce in Naples is focused on the oil and gas industries and recreation. Naples is the fastest-growing city in the project area (U.S. Census Bureau 2000; Governor’s Office of Planning and Budget 2005).

Land in the northern part of Naples is zoned for industrial uses. This is a continuation of Vernal's industrial zone. South of about 1750 South, the zoning changes to commercial. There is a Commercial Design Guideline Overlay area all along U.S. 40 within the city. The Vernal Airport is accessed from U.S. 40 in Naples. The Naples City offices are located in the southern part of the city where U.S. 40 turns southeast at the intersection of 1500 East.

The Naples Transportation Plan (Naples City Corporation 2006) identifies U.S. 40 as a 110-foot-wide arterial. The plan also notes that growth in the area will require improvements to the intersections of U.S. 40 and 1500 South and U.S. 40 and 500 South. UDOT is currently installing a signal at 500 South in Vernal; this is a different intersection than the 500 South in Naples that intersects U.S. 40.

3.1.3 State and Federal Government Agencies

U.S. Forest Service

The USFS manages much of the land along the western end of the project corridor. USFS ownership begins in Daniels Canyon and extends to the east side of Strawberry Reservoir. There are a few areas of private ownership in this stretch of U.S. 40 (such as at the intersection of East Main Canyon Road and U.S. 40, the area west of the reservoir, and around the reservoir itself), but USFS is the primary landowner in this area.

This land is part of the Uinta National Forest. The project corridor passes through the Strawberry Reservoir Management Area, as described in the Uinta National Forest Plan. The reservoir is the main feature of the management area, and U.S. 40 provides the primary access to the area, though the area is managed for multiple uses. The area experiences heavy recreation use due to its notable sport fishery and its proximity to population centers in the Salt Lake and Utah Lake Valleys. The forest plan recognizes the importance of U.S. 40 in the Strawberry Reservoir Management Area but does not prescribe any specific goals or objectives for the highway's relationship to future resource management in the area.

Bureau of Land Management

Most of the federal BLM-administered land along the project corridor is between the eastern boundary of the Uintah-Ouray Indian Reservation and Vernal, though there are small areas of BLM administration on the western end of the corridor near Heber and on the eastern end near Jensen. Most of the BLM-administered land along the corridor is managed by the BLM's Vernal Field Office. The BLM has identified formal Transportation and Utility Corridors throughout the region, including along and near U.S. 40 between the eastern boundary of the Uintah-Ouray Indian Reservation and the state trust lands west of Vernal and between the eastern limits of the city of Naples to the Utah-Colorado state line. According to BLM, the purpose of designating these transportation corridors is to show where the agency encourages the placement of utilities, and the corridors largely exist in areas where there are existing facilities. Any improvements to U.S. 40 would not affect the way BLM currently manages the land along these corridors. If improvements to U.S. 40 required acquisition of right-of-way from BLM, then that agency would consider how such an action could affect overall ownership and management of its landholdings in the area (Howard 2007).

State of Utah School and Institutional Trust Lands Administration

The State of Utah School and Institutional Trust Lands Administration (SITLA) owns parcels of land and mineral-only lands (subsurface land) all along U.S. 40. Most SITLA-owned land along the project corridor is situated between the eastern boundary of the Uintah-Ouray Indian Reservation and the city of Vernal. SITLA-owned mineral-only lands occur in Daniels Canyon in Wasatch County and between the cities of Duchesne and Roosevelt in Uintah County.

SITLA land, which is managed for the financial benefit of 12 real estate trusts, is occasionally made available for purchase by private parties. SITLA surface land can also be leased for telecommunication towers, commercial and industrial enterprises, cabin sites, and agriculture; be permitted for grazing; be used for easements for roads, pipelines, power lines, and other types of transmission lines; and be used short-term for activities such as filming (such as movies and commercials) and other organized events (such as cross-country races). Subsurface lands can be leased for mineral resources such as oil, gas, coal, sand, and gravel.

State of Utah Division of Wildlife Resources

The Utah Division of Wildlife Resources manages a number of wildlife management areas (WMAs) on or near U.S. 40. A portion of an unnamed WMA intersects the highway at about MP 23, and the Currant Creek WMA touches U.S. 40 at about MP 58. Other WMAs that are close to but not on the corridor include the Strawberry River WMA and the Tabby Mountain WMA (DWR 2002). The WMAs are managed for passive recreational use (such as hiking and wildlife viewing), habitat protection, big-game hunting opportunities, fishing, and as wildlife refuges. Overnight camping is allowed at the Currant Creek and Tabby Mountain WMAs.

Uintah and Ouray Indian Reservation

The Uintah and Ouray Reservation is located in the heart of the Uintah Basin. The reservation headquarters are in Fort Duchesne, which is just south of U.S. 40. It is the second largest Indian reservation in the United States and encompasses over 4.5 million acres. The Uintah Mountains define the northern border of the reservation, while the Green River runs through the reservation's southern end.

The tribal government oversees the reservation and about 1.3 million acres of off-reservation trust land. There are several distinct residential communities associated with the reservation. The tribal government operates several businesses that also define much of the land use, including mining (oil, gas, tar sands, and gilsonite) and livestock production.

3.1.4 Land Use Survey

In April of 2007, HDR conducted a "windshield" (driving) survey of the U.S. 40 corridor. This study was conducted in order to verify information on land use maps obtained from cities in Uintah and Duchesne counties and from the Wasatch, Duchesne, and Uintah County governments. The survey is presented according to eight segments along the corridor; more detailed information is available in the Land use Inventory technical report.

Segment 1: Project Start (MP 21) to Daniels Summit (MP 34). This 13-mile-long segment passes through mostly undeveloped land in Wasatch County. One USFS toilet area is available at about MP 34. However, this site is intended for use during winter recreation activities and is not maintained during summer months. Most land along the highway is managed by USFS.

Segment 2: Daniels Summit (MP 34) to the Western Duchesne City Limit (MP 86). This segment, which is 52 miles long, passes through mostly undeveloped land in Wasatch and Duchesne Counties. Most land between Daniels Summit and Strawberry Reservoir is managed by USFS, though there is limited private recreational development around the reservoir. Between the eastern side of the reservoir and western Duchesne County, the corridor passes through state-owned land (WMAs) and private land. Most of the land between the Wasatch County–Duchesne County line and the city of Duchesne is privately owned and is used for agriculture with scattered residential use. The land around

Starvation Reservoir is managed as a state park. A UDOT rest area is available on the south side of U.S. 40 at MP 70.

Segment 3: Incorporated Area of Duchesne City (MP 86 to MP 88). This two-mile-long segment in Duchesne County consists of the portion of the corridor within the Duchesne city limits. Development is typical of that found in rural towns. Land along the highway is dedicated primarily to commercial uses, though there is some residential and industrial development.

Segment 4: Eastern Limit of Duchesne (MP 88) to the Western Limit of Roosevelt (MP 112). This 24-mile-long segment covers an area dominated by private and tribal land. This area supports some agricultural production and limited oil and gas development with scattered residential use. A residential community called Utah Mini Ranches is located just west of the Strawberry River turn-off between MP 88 and MP 96.5. This segment passes through the city of Myton at MP 104.5 to MP 106. Development in Myton is typical of rural towns, with scattered residential and agriculture. The segment is entirely within Duchesne County.

Segment 5: Roosevelt and Ballard Incorporated Areas (MP 112 to MP 119). This segment, which is 7 miles long, encompasses the area within the incorporated limits of the cities of Roosevelt and Ballard. The Duchesne County–Uintah County line marks the political division between Roosevelt and Ballard, but the area functions as a single, more urbanized area. A privately owned paint ball park is located on the south side of the highway at MP 118. Development is dominated by commercial uses, though there is some residential development and agricultural use interspersed along the segment.

Segment 6: Eastern Limit of Ballard (MP 119) to the Western Limit of Vernal (MP 142). This 23-mile-long segment is characterized by tribal land and private land in the western half and BLM-administered and state-owned land in the eastern half. A school is located on U.S. 40 at MP 119.5, and low-density residential and commercial use continues until MP 122. Agricultural use occupies land along MP 122 through 125.5. A rest area with picnic facilities is located at about MP 140. There is some oil- and gas-related development along the highway, though most oil and gas wells are south of U.S. 40 on tribal and BLM-administered land. This segment is entirely within Uintah County.

Segment 7: Vernal and Naples Incorporated Areas (MP 142 to MP 149). This seven-mile-long segment is dominated by urban development normally associated with rural cities. Development immediately adjacent to the highway is characterized by commercial and industrial development, with limited residential development interspersed throughout. The city of Naples begins at about MP 148 where agricultural and residential use is interspersed with commercial and industrial development.

Segment 8: Eastern Limit of Naples (MP 149) to Project End (MP 157). This segment, which is 8 miles long, is mostly under private ownership and is characterized by rural residential and agricultural development. A power station is located along the north side of U.S. 40 at MP 151. A newly graded area that appears to be prepared for development is located at MP 154.9, but it is unknown if this area will serve commercial or residential use. A church and park are located on the north side of the highway at MP 156.5. State-owned land that touches the highway just west of Jensen supports a limited number of oil and gas wells.

3.2 Demographics

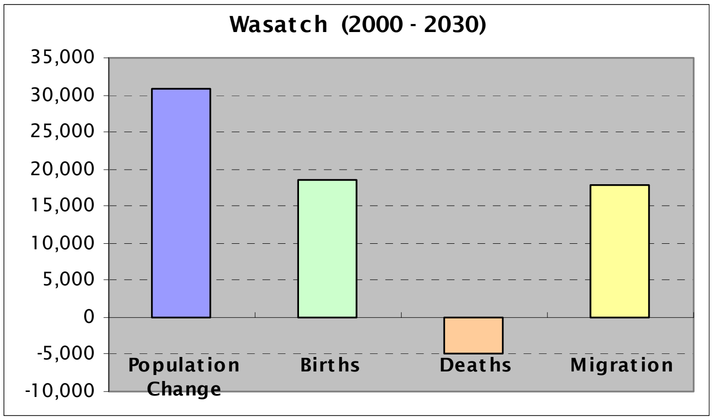
Operation of the U.S. 40 corridor is influenced by existing population and employment in the area. Population and employment growth will affect how the highway functions and might generate the need for future roadway improvements. The following is a summary of current and projected population and employment in the cities and counties along the U.S. 40 project corridor. Most of the information presented below is based on the best available data and may not reflect localized population and employment trends. More detailed demographics information is available in the Technical Memo on Population and Employment for Wasatch, Duchesne, and Uintah Counties (HDR 2007c).

3.2.1 Population

Although Wasatch County is only marginally within the project corridor, demographic changes in the county, particularly in the Heber City area, might affect the western end of the corridor. Much of the traffic on this western end of the corridor that originates in Wasatch County and beyond would be related to recreational use in the Uintah Basin. However, employment growth in the Uintah Basin might also contribute to the continued development of the Heber City-Midway area, resulting in more trips between the basin and eastern Wasatch County. As one of the most rapidly growing counties in Utah, Wasatch is projected to grow at an average of 3.72% per year between 2000 and 2030 and reach 30,760 people in 2030 (15,433 people in 2000;

Figure 3-2). Migration accounts for almost 60% of the projected growth (Governor's Office of Planning and Budget 2005a).

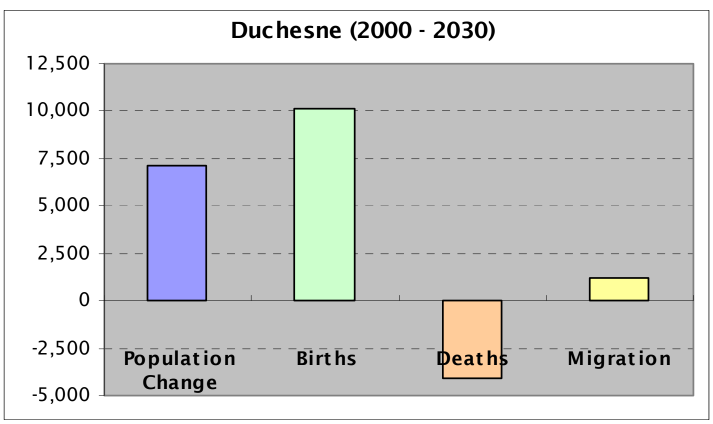
Figure 3-2. Wasatch County Projected 30-Year Population Growth



Source: Governor's Office of Planning and Budget 2005a

The Governor's Office of Planning and Budget projects a total population of 21,500 people in Duchesne County by 2030 (Governor's Office of Planning and Budget 2005a). This will mean adding 7,100 people between 2000 and 2030 at an approximate annual growth rate of 1.35%. Natural growth (births minus deaths) will account for 83% of the population increase between 2000 and 2030 (Figure 3-3).

Figure 3-3. Duchesne County Projected 30-Year Population Growth

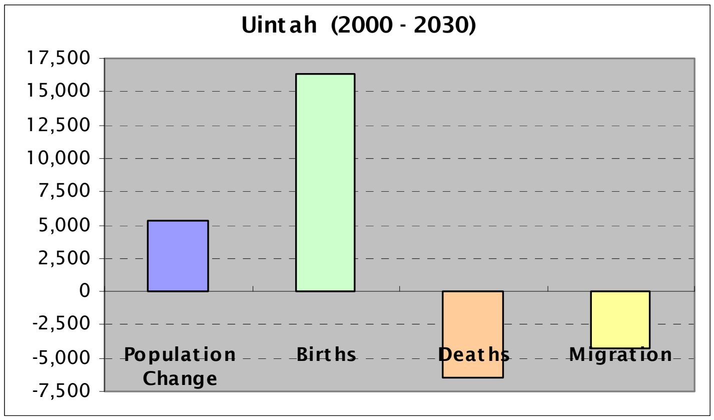


Source: Governor's Office of Planning and Budget 2005a

The Governor's Office of Planning and Budget expects the population in Uintah County to increase by 5,350 people between 2000 and 2030 (Figure 3-4). The Governor's Office projects an annual growth rate of 0.64% between 2000 and

2030, resulting in a population of 30,760 people by 2030 (Governor's Office of Planning and Budget 2005a). Given the recent increase in oil and gas development in the basin, the Governor's Office of Planning and Budget projections might be lower than the actual annual growth rate of the more populated areas of Uintah County.

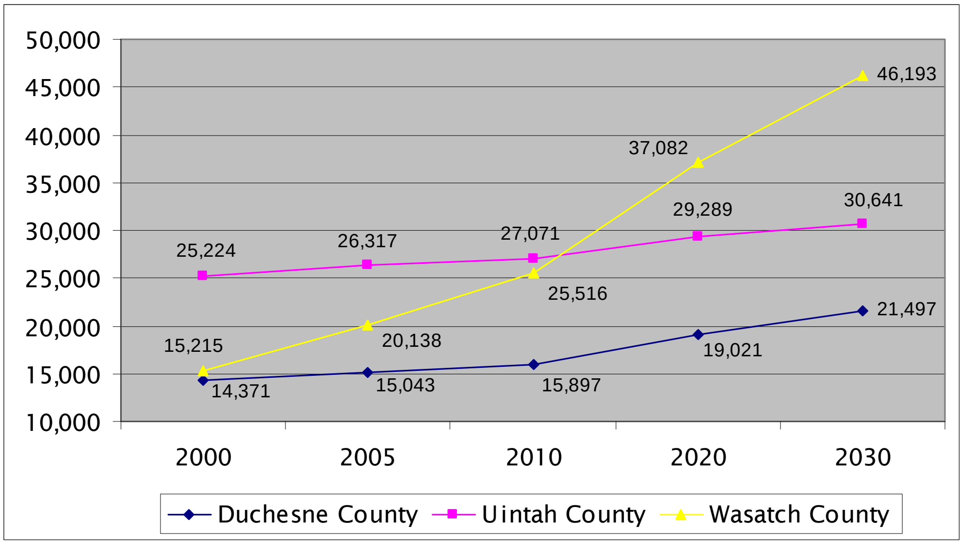
Figure 3-4. Uintah County Projected 30-Year Population Growth



Source: Governor's Office of Planning and Budget 2005a

Overall, the Governor's Office of Planning and Budget population projections show moderate growth in both Duchesne and Uintah County and very rapid growth in Wasatch County. As mentioned above, recent oil and gas development might result in a growth rate for Uintah County that is not reflected in the Governor's Office of Planning and Budget projections. Updated information from the Governor's Office and from the Uintah Basin Association of Governments (Governor's Office of Planning and Budget 2007) continues to show moderate growth in Duchesne County (+1.3% per year) and in Uintah County, though at a slightly higher rate than projected in 2005 (up to +1.7% per year from 0.64% per year; Governor's Office of Planning and Budget 2007a). Figure 3-5 compares the projected population growth for the counties along the corridor at each five-year increment and the total expected population by 2030.

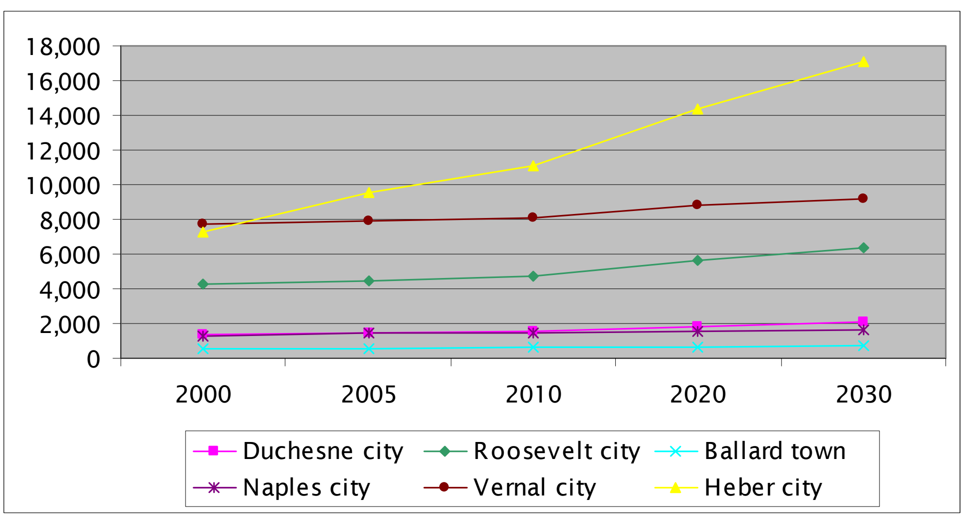
Figure 3-5. Comparison of Projected 30-Year Population Growth for Wasatch, Duchesne, and Uintah Counties



Source: Governor's Office of Planning and Budget 2005a

Cities along the corridor are projected to grow between 0.6% and 1.3% annually between 2000 and 2030. Heber City, east of the project study area is projected to grow at 2.9%. Figure 3-6 compares the cities' projected population growth.

Figure 3-6. Comparison of Projected 30-Year Population Growth for Cities Along the U.S. 40 Project Corridor



Source: Governor's Office of Planning and Budget 2005a

Table 3.2-1 summarizes the expected population growth for each county and city in the corridor as well as state totals.

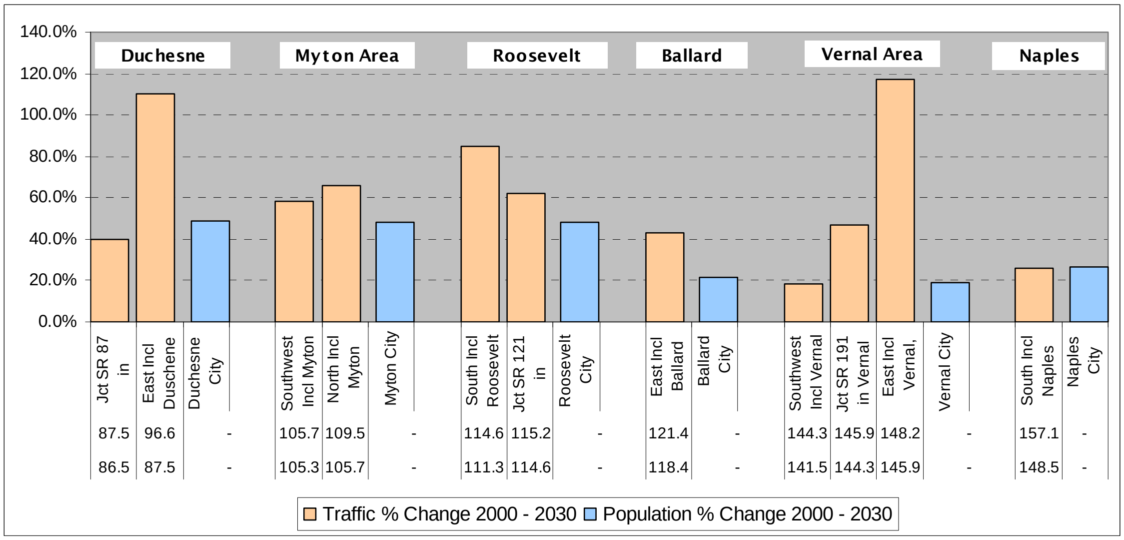
Table 3.2-1. Expected Population Growth along the U.S. 40 Project Corridor

	Population					
Area	Census 2000	2005	2010	2020	2030	Average Annual Growth Rate
Utah	2,233,169	2,528,926	2,833,337	3,486,218	4,086,319	2.03%
Wasatch County	15,433	20,138	25,516	37,082	46,193	3.72%
Heber city	7,291	9,521	11,133	14,361	17,081	2.88%
Duchesne County	14,371	15,043	15,897	19,021	21,497	1.35%
Duchesne city	1,408	1,466	1,549	1,854	2,095	1.33%
Myton city	539	559	591	707	799	1.32%
Roosevelt city	4,299	4,462	4,716	5,642	6,377	1.32%
Uintah County	25,224	26,317	27,071	29,289	30,641	0.65%
Ballard town	566	590	607	657	687	0.65%
Naples city	1,300	1,412	1,453	1,572	1,644	0.79%
Vernal city	7,714	7,898	8,125	8,790	9,196	0.59%

Source: Governor's Office of Planning and Budget 2005a

Figure 3-7 compares the projected percentage increase in traffic along the more urbanized segments of the corridor, with the projected percentage increase in population in the cities along those segments. The increases in traffic, particularly in Duchesne and Vernal, are much higher than the expected population growth. Although a high percentage of through traffic could partially explain this, there seems to be a need for adjustment between the traffic and population projection in the corridor.

Figure 3-7. Comparison of Projected 30-Year Population Growth and Traffic Along the U.S. 40 Project Corridor



Source: Governor's Office of Planning and Budget 2005a; Utah Department of Transportation 2005b

3.2.2 Employment

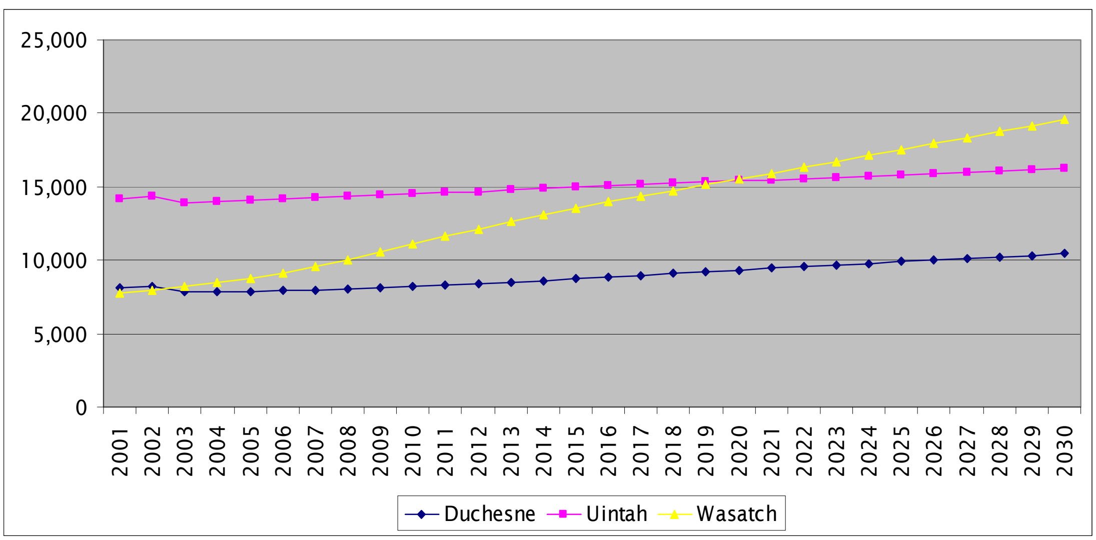
The Governor's Office of Planning and Budget provides employment projections at the county level only (Governor's Office of Planning and Budge 2005b). Except for Wasatch County, which is expected to grow at 3.15% per year, employment growth in the counties along the corridor is expected to be less than half to a third of the rate expected for the state (0.84% for Duchesne County and 0.45% for Uintah County compared to 1.96 for the State of Utah). Table 3.2-2 and Figure 3-8 summarize employment growth by county.

Table 3.2-2. Employment Growth by County along the U.S. 40 Corridor

Area	Employment 2001	2005	2010	2020	2030	Average Annual Growth Rate
Utah	1,392,577	1,482,410	1,697,725	2,084,097	2,493,070	1.96%
Duchesne County	8,113	7,888	8,189	9,333	10,437	0.84%
Uintah County	14,188	14,071	14,534	15,394	16,216	0.45%
Wasatch County	7,727	8,788	11,081	15,543	19,607	3.15%

Source: Governor's Office of Planning and Budget 2005b

Figure 3-8. Projected 30-Year Employment Growth for Wasatch, Duchesne, and Uintah Counties



Source: Governor's Office of Planning and Budget 2005b

Most of the Governor's Office of Planning and Budget projections do not seem to reflect the current rate of employment activity related to the oil and gas industries in Uintah County. Preliminary traffic projections for the corridor indicate a higher level of activity than that explained by the projected population and employment numbers, even when assuming a high percentage of through traffic (see Section 2.3.1 above for more detailed information about traffic conditions). Recent estimates by the Governor's Office of Planning and Budget project a peak in Uintah County mining employment of about 4,000 workers in about 2010 and then a decline of about 25% in the following 20 years (Governor's Office of Planning and Budget 2007b). The estimated 2050 mining employment would still be about the same as the 2004 high employment rate (about 3000 workers). The projected decline is due to a number of factors, the most significant of which are the low number of workers that will be needed to operate the completed wells (about 5 workers are needed per completed well) and the estimated resource extraction amounts over time. Like Uintah County, Duchesne County's economy is driven in a large part by jobs in the natural resources and mining and trade, transportation, and utilities industries. Because of this, it is likely that the same mining employment trend would apply to Duchesne County.

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4.0 Existing Transportation Plans

4.1 Utah Department of Transportation Plans and Guidance

UDOT prepares a statewide transportation plan and a complementary but separate statewide transportation improvement program (STIP). These planning processes are guided by state and federal law and as well as UDOT's goals, which are:

- Take Care of What We Have
- Make the System Work Better
- Improve Safety
- Increase Capacity

UDOT's Systems Planning and Programming group, as well as the regional offices, carry projects from the planning stages through construction. The following summarizes how the statewide transportation plan and statewide transportation improvement program address improvements to U.S. 40 and provides information about UDOT's environmental review procedures.

4.1.1 Statewide Transportation Plan

The Statewide Transportation Plan is made up of five separate plans: a long-range transportation plan (LRTP) and regional transportation plans prepared by the state's four designated metropolitan planning organizations. The LRTP is the plan for rural and small urban areas in Utah and covers all highways designated as state routes, U.S. highways, and interstates outside of the metropolitan boundaries. The U.S. 40 corridor is addressed in the LRTP because it is not in a designated metropolitan planning area.

The LRTP is updated every four years. UDOT adopted a new LRTP covering the period between 2007 and 2030 on in June 2007. The plan addresses projects in three phases as well as an "unfunded phase". Projects that would include or directly affect are included in the LRTP include:

- Widening from U.S. 189 (in Heber City) to Daniels Road (mouth of canyon), 9.8 miles in Wasatch County
- Widening of SR 121 from U.S. 40 to MP 5 (Roosevelt), five miles in Duchesne County

- Widening from Vernal to SR 149 (Jensen), 10.9 miles in Uintah County

These projects are all included in the "unfunded Phase" category. Passing lanes in all areas of the state are included in the three funded phases. The LRTP also notes that additional priorities may by identified from future needs analyses in emerging small urban areas, including Vernal.

4.1.2 Statewide Transportation Improvement Program

UDOT's STIP is a five-year plan of highway and transit projects for the state of Utah. The STIP is published every year and includes transportation projects on the state, city, and county highway systems, as well as projects in the national parks, national forests, and Indian reservations. These projects are funded through a number of federal and state programs.

The STIP serves two basic purposes. First, it is the basis for approval of federal-aid highway and transit funds by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). Second, the STIP is UDOT's official work plan for the development of projects through conception, environmental studies, right-of-way acquisition, planning, and advertising for construction.

Table 4.1-1 lists the current 2007-2012 STIP projects for the U.S. 40 corridor. It should be noted that one of the purposes of this corridor study is to identify additional projects for inclusion in the next STIP as well as subsequent STIPs.

Table 4.1-1. 2007–2012 STIP Projects Along the U.S. 40 Corridor

Project Number	Project Type	Project Location
Wasatch County		
NH-0040(52)29	Rotomill and overlay road	U.S. 40–Clegg Canyon to Strawberry Valley Note: Project completed in 2007
F-0040(69)40	Asphalt pavement reconstruction	U.S. 40 MP 54.7 to Wasatch-Duchesne County Line
Duchesne County		
BHF-0040()83	Bridge rehabilitation	U.S. 40 bridge over Starvation Reservoir
SP-0040(61)122	Construct new traffic signal	U.S. 40 and 7500 East, Fort Duchesne
S-0040(64)88	Passing lanes	U.S. 40–between Duchesne and Roosevelt
NH-0040(5)111	Widening (to 3 lanes)	U.S. 40– west Roosevelt to Ioka Junction
Uintah County		
SP-9999(738)	Reconstruct intersection for traffic signal	U.S. 40 and 500 South in Vernal
NH-0040(49)115	Widening (to 3 lanes)	U.S. 40–east Roosevelt to Ballard eastern city limit Note: Project completed in 2007

Table 4.1-1. 2007–2012 STIP Projects Along the U.S. 40 Corridor

Project Number	Project Type	Project Location
S-0040(68)141	Passing lanes	U.S.40 from MP 139 to MP 141
S-R399(36)	Intersection improvement	U.S. 40 and SR 88 intersection
S-0040(60)136	Widening and adding passing lanes	U.S.40–"Twists" to Vernal Note: Project completed in 2007
STP-LC47(10)	Beautification	Vernal city

Source: UDOT 2007a

4.1.3 UDOT Environmental Services

UDOT has an established process for environmental review of proposed projects. If projects receive federal funding or require some other sort of federal action, such as issuance of a federal permit, UDOT works closely with the responsible federal agency to ensure that the environmental review also meets that agency's needs. UDOT has specific guidance for the preparation of environmental documents, analysis of impacts (such as those related to traffic noise), and preparation of technical reports (such as geotechnical studies). If carried forward, projects identified through the U.S. 40 corridor study would be evaluated through the Environmental Services division, as needed and appropriate.

4.2 Federal Agency Plans and Guidance

4.2.1 U.S. Forest Service

The USFS administers much of the federal land along the western end of the project corridor as part of the Uinta National Forest. Federal ownership begins in Daniels Canyon and extends to the east side of Strawberry Reservoir.

The USFS updated its land and resource management plan for the Uinta National Forest in 2003 (USFS 2003). The project corridor passes through the Strawberry Reservoir Management Area of the forest. The reservoir is the main feature of the management area, and U.S. 40 provides the primary access. The area has heavy recreation use due to its notable sport fishery and proximity to population centers in the Salt Lake and Utah Lake valleys. The land and resource management plan recognizes the importance of U.S. 40 in the Strawberry Reservoir Management Area but does not prescribe any specific goals or policies for the highway's relationship to future resource management in the area.

4.2.2 Bureau of Land Management

Most of the BLM-administered land along the project corridor is between the eastern boundary of the Uintah-Ouray Indian Reservation and Vernal. There are also small areas of BLM-administered land on the western end of the corridor near Heber City and on the eastern end near Jensen (SITLA 2007a, 2007b, and 2007c).

The Vernal Field Office completed a draft Environmental Impact Statement (EIS) on its proposed draft Vernal District Resource Management Plan (RMP) in 2004. The BLM is currently preparing a supplement to the draft EIS (Howard 2007). The proposed Vernal RMP identifies transportation and utility corridors throughout the Vernal Field Office's management area (BLM 2005). These corridors were previously identified through the BLM's western regional corridor study, so they currently exist and are not dependent upon finalization of the RMP. The BLM has identified these corridors along U.S. 40 between the eastern boundary of the Uintah-Ouray Indian reservation and the State Trust Lands west of Vernal and between the eastern limits of the city of Naples to the Utah-Colorado state line. According to the BLM, the designation of these transportation corridors is to show where the agency encourages the placement of utilities, and the corridors largely exist in areas where there are existing facilities. Any improvements to U.S. 40 would not affect the way the BLM currently manages its lands along these corridors. If construction of improvements to U.S. 40 required acquisition of right-of-way from BLM, then that agency would consider how such an action may affect overall ownership and management of its landholdings in the area (Howard 2007).

4.3 Indian Reservation Road Inventory

Indian reservation roads (IRRs) are public roads located within or that provide access to an Indian reservation or Indian trust land; restricted Indian land that is not subject to fee title alienation without the approval of the Federal government; and Indian or Alaska Native Villages, groups, or communities in which Indians and Alaska Natives reside and whom the Secretary of the Interior has determined are eligible for services generally available to Indians under Federal laws specifically applicable to Indians. The Bureau of Indian Affairs (BIA) maintains an IRR Program, which includes a comprehensive road inventory, in support of its road funding program. The IRR inventory includes information on road classifications, route numbers, bridge numbers, current and future traffic volumes, maintenance responsibility, and ownership.

The Uintah-Ouray Indian Reservation is in the BIA's Western Region. The IRR data for the reservation and associated trust lands lists 124 road segments in Uintah and Duchesne counties (51 in Duchesne County and 73 in Uintah County; two of the Uintah County segments are listed as "proposed") representing 64 official routes. The routes can cross county lines and in some cases extend into neighboring Grand County.

Though Uintah-Ouray Reservation IRR includes some information about functional classifications, road ownership, roadbed condition, surface type, shoulder type, and pavement condition, it does not provide specific information on the location of the 64 routes. Table 4.3-1 summarizes the condition of reservation road segments in Duchesne and Uintah Counties for which nearly complete data are available.

Table 4.3-1. Summary of IRR Segments in Duchesne and Uintah County Portions of the Uintah-Ouray Indian Reservation

	Number of Segments	
	Duchesne County	Uintah County
Segments of Existing Road, Including Bridges	51	71
Segment Surface Type[1]		
Native	17 (35%)	22 (33%)
Gravel	12 (25%)	8 (12%)
Bituminous Material < 2" Thick	5 (11%)	3 (4%)
Bituminous Material > 2" Thick	14 (29%)	34 (51%)
Segment Ownership		
BIA	33	66
Tribe	1	0
State	10	5
County or Township	6	0
Other Federal Agencies	1	0

[1] Segments that are on bridges are not included in the surface type inventory.

Source: BIA 2006

4.4 Wasatch County Plans and Guidance

Wasatch County completed its 20-year Master Transportation Plan in 1998. The intent of this plan is to identify a system that will accommodate the county's anticipated growth through 2020. The Master Transportation Plan is incorporated into the county's general plan (which was completed in 2001) by reference.

The Master Transportation Plan focuses on improvements that will encourage connectivity between neighboring communities and counties while limiting the impacts of major corridors on overall quality of life. One of the main purposes of the plan was to update street classifications and to recommend improvements. Recommended improvements are focused on the Heber City-Midway area, which is out of the corridor study area; the plan does not directly address U.S. 40. The plan does recommend improvement to a section of Main Canyon Road (between Roundy Lane and the USFS boundary), which parallels U.S. 40 and ultimately intersects the highway on USFS land near Daniels Summit. This road serves rural residential development on private land and provides access to recreational opportunities on the USFS land.

The Wasatch County General Plan includes a transportation chapter. This plan shows U.S. 40 as an arterial roadway. The General Plan states that roadways identified as arterials should have right-of-ways that include adequate space for the roadway, trails, and green space. The General Plan discourages driveway access to arterial roadways but does not include specific access standards.

4.5 Duchesne County Plans and Guidance

4.5.1 Duchesne County General Plan

The Duchesne County General Plan (Duchesne County 1997, as amended in 1998 and 2005) contains a section that addresses public access and RS 2477 roads (roads built prior to October 21, 1976, on rights of way across non-reserved federal lands). As noted above, this section also incorporates the county's transportation system map by reference. The current transportation system map contains B roads only. B Roads are all public highways, roads, or streets that are traveled ways under the jurisdiction of, and maintained to be free from such obstructions as excessive high centers, overgrowth of vegetation, and washouts by a county or incorporated municipality over which a conventional two-wheel drive vehicle may travel. The general plan does not specify physical standards (such as geometric or access standards) for B roads.

4.5.2 City Plans

Duchesne

The city of Duchesne and UDOT completed a draft transportation plan in 2005 (UDOT 2005c). The Duchesne Community Transportation Plan states that U.S. 40 provides a vital function to Duchesne City proper and allows access to adjacent municipalities. No specific width for U.S. 40 is described in the plan.

The plan identifies the following projects as having the highest priority to the Duchesne City Transportation Advisory Committee:

- Signal warrant study for intersections along U.S. 40, especially the intersection of U.S. 40 and SR 87
- Speed study at each entrance to the city, including those on U.S. 40
- Construct turn pocket on U.S. 40 at east end of town for businesses adjacent to Strawberry River

Duchesne experiences a significant increase in traffic during the summer months. In addition, hourly traffic on U.S. 40 generally peaks during the afternoon commute hours (between 3:00 PM and 6:00 PM). Duchesne recognizes the need to provide direction for continual maintenance and improvements to its transportation system.

Roosevelt

UDOT and the city of Roosevelt completed a draft Transportation Master Plan 2005 (UDOT 2005d). This plan is intended to provide direction for maintenance and improvements to the transportation system that are directly related to the city's recent increase in population. The plan does not describe a specific width for U.S. 40.

The plan identifies the following projects as having the highest priority:

- Replace Dry Gulch irrigation culvert under US 40
- Improve intersection of US 40 and SR 121
- Make improvements to Cottonwood Creek Bridge on US 40 to address 4 lane to 2 lane bottleneck
- Add sidewalk to Cottonwood Creek bridge over US 40

Roosevelt experiences a significant increase in traffic during the summer months. In addition, hourly traffic on U.S. 40 generally peaks during afternoon commute hours (between 3:00 PM and 6:00 PM). Accident data provided by UDOT for 2003 show a higher than expected accident rate at MP 114.94 and MP 115.55.

Roosevelt recognizes the importance of building and maintaining safe roadways for auto traffic as well as pedestrians and bicyclists.

4.6 Uintah County Plans and Guidance

4.6.1 Transportation System Map

As noted earlier, the 2005 Uintah County Transportation System Map classifies U.S. 40 as a state road (Uintah County 2005b). Many different types of roads intersect U.S. 40 along its length in Uintah County, including paved, gravel, native material, unmaintained (i.e., roads that are not maintained by the county but may be maintained by another entity), and city roads. Most intersecting roads in the Fort Duchesne area are paved and once the highway crosses into the Uintah and Ouray Indian Reservation, there are many intersecting roads that are not maintained by the county. Major roads that are maintained along the stretch between the reservation boundary and Vernal include SR 88 (state highway), Road 2230 (native material), Twelvemile Wash Road (paved turning to gravel), McCoy Flats Road (paved), and Dog Valley Road (native material). SR 88 carries a substantial amount of traffic related to oil and gas development area in the southern part of the Uintah Basin. Uintah County would like to extend SR 88 south to connect to Interstate 70 to provide an alternate route for some of this traffic (Steinvorth 2007).

A number of paved roads intersect U.S. 40 east of Vernal and Naples. There are only a few unmaintained roads intersecting the highway between the Vernal/Naples area and the eastern project limit. SR 149, identified as a state highway, intersects U.S. 40 at the eastern project terminus.

4.6.2 Uintah County General Plan

The Uintah County General Plan includes a transportation chapter, which focuses on overarching county-level policies (Uintah County 2005a). As noted above, the plan does not specifically address U.S. 40. The plan does, however, include some policies that address general roadway development or coordination with UDOT. These policies include direction on developing and maintaining county road standards and coordinating with UDOT during development of a master transportation plan and road maintenance plan.

4.6.3 City Plans

Ballard

UDOT completed a draft transportation plan for Ballard in 2005 (UDOT 2005e). This plan recognizes the importance of building and maintaining safe roadways, not only for auto traffic but also for pedestrians and bicyclists. No specific width for U.S. 40 is described in the plan.

Ballard is actively promoting the improvement of bicycle facilities to accommodate recreational cyclists and bicycle tour groups traveling along U.S. 40. As Ballard grows, pedestrian traffic will be accommodated through improvement to sidewalk system along the highway. Ballard experiences a high rate of longer combination vehicle (large truck) traffic coming from oil fields around Ballard along U.S. 40 northwest to Salt Lake City. These trucks have difficulty negotiating tight turning radii when entering or leaving businesses, oil well access roads, and turning on to and off of U.S. 40.

Like other small cities along the corridor, Ballard experiences a significant increase in traffic during the summer months. In addition, hourly traffic flows are consistent with afternoon commuter peak and increase between 3:00 to 6:00 PM. Accident data provided by UDOT for 2003 show a higher than expected accident rate between MP 121.78 and MP 123 along U.S. 40.

Ballard's plan identifies the following projects as having the highest priority:

- Widen US 40 from Ballard to Fort Duchesne
- Improve the intersection of US 40 and 3500 East (modify turn radii and add turn lanes)

Vernal

The city of Vernal, in coordination with UDOT, completed a transportation master plan in 2006 (UDOT 2006d).

Within the incorporated area of Vernal, U.S. 40 is classified as a major arterial. The plan describes U.S. 40 as a direct link to Colorado, Salt Lake City, and the nearby recreation areas of Flaming Gorge and Dinosaur National Monument.

The transportation plan identifies some of the major transportation issues as follows:

- Motorist safety
- Bicycle and pedestrian safety

- Signals
- City gateway aesthetics
- Property access
- Truck traffic
- Speed limits

The Technical Advisory Committee for the transportation plan identified the following as priority improvements:

- Intersection improvement at U.S. 40 and 1000 South (west side)
- Intersection improvement at U.S. 40 and 100 South
- Intersection improvement at U.S. 40 and 500 East
- Intersection improvement at U.S. 40 and 500 East (east side)
- Roadway improvement on 1000 South from U.S. 40 to 500 East

Traffic flow on U.S. 40 is consistent with summer recreation use, and peaks in the month of July. Daily traffic flows peak between 4:00 PM and 7:00 PM and reflect commuter travel as well as student traffic from campuses in Roosevelt and Vernal. Accident data from UDOT for 2002 demonstrate a higher than expected accident rate between MP 139.69 and MP 141.47 in the incorporated area of Vernal.

Uintah Basin Transportation Special Service District, an independent quasi-governmental agency, also does some transportation planning for Vernal. The Special Service District is currently working with the city on a bypass roadway planning effort. As of this time, no formal plans have been proposed for a bypass.

Naples

UDOT and the city of Naples jointly completed a transportation plan in 2006 (UDOT 2006e). The plan recognizes the need to improve circulation in the area in order to accommodate anticipated growth and development. The plan identifies major transportation needs, many of which focus on the U.S. 40 corridor, which is the lifeline of Naples.

The Naples Transportation Plan identifies U.S. 40 as a 110-foot-wide arterial. Major collector streets (which have a right-of-way width of 80 feet) intersecting U.S. 40 in the city include 500 South, 1000 South, 1500 South, 2000 South, 2500 South, and 3000 South. Typical cross sections are included in the plan.

Finally, the plan provides a good summary of needs and presents a project list and cost estimates. In summary, the plan states that there is a need to complete a study of East U.S. 40 that addresses access management, signal warrants, and realignment and relocation of SR 45. Specific recommendations for projects not currently listed in the STIP include:

- Widen U.S. 40 all the way from Roosevelt to Vernal (the STIP includes only the portion between east Roosevelt and east Ballard)
- Widen SR 45 and realign its intersection with U.S. 40
- Complete intersection improvements at U.S. 40 and 1500 South
- Complete intersection improvements at U.S. 40 and 500 South
- Complete signal warrant studies for the intersections of U.S. 40 and 500 South and U.S. 40 and 1500 South

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5.0 Issues Summary

5.1 Issues Identification Process

5.1.1 What Has Happened to Date?

The issues identification process for the U.S. 40 Corridor Study occurred during March, April, and May 2007. The process included stakeholder interviews, public workshops, stakeholder workshops, and individual comments received through the U.S. 40 Corridor Study web site or directly by UDOT.

Stakeholder interviews included one-on-one and small group sessions with a total of about 60 stakeholders across the corridor. Stakeholders interviewed included:

- County commissioners from Wasatch, Duchesne, and Uintah counties
- Elected officials and staff representing the cities of Naples, Vernal, Roosevelt, and Duchesne
- County road department personnel
- School district representatives
- Law enforcement and safety personnel from the Utah Highway Patrol, city police departments, and county sheriff's departments
- Uintah County Special Transportation District representatives
- UDOT maintenance supervisors for U.S. 40
- USFS personnel from the Uinta National Forest
- Ute Indian Tribal representatives

The public was invited via general postcard mailings, media announcements, and targeted mailings to attend one of three public workshops to learn about the project and to provide input regarding corridor issues. The public meetings were held in Vernal, Roosevelt, and Heber City on April 30, May 1, and May 2, 2007, respectively. These workshops included a formal presentation and information available in an open house format to introduce the corridor study process, present basic existing condition information, present highlights of the issues heard to date, and to gather input regarding particular corridor issues.

Stakeholder workshops gave interested stakeholders a chance to interact and to openly discuss the project corridor, issues, and potential solutions.

Representatives from local governments; local, state, and federal agencies; key businesses; and affected organizations across the corridor were invited to attend one of three stakeholder workshops in Vernal, Roosevelt, and Heber City on April 30, May 1, and May 2, 2007, respectively. The workshops included presentation of information about basic existing corridor conditions and a summary of the issues that had been identified to date. Stakeholders were invited to add new issues and to provide input regarding priorities for the general types of corridor issues.

5.1.2 What Happens Next?

UDOT will use information gathered during the stakeholder interviews and workshops, during the public workshops, and through ongoing communication with the public to carry the project into the next stage. Using this information, UDOT will develop a vision statement for the corridor, identify and prioritize the most urgent issues in need of consideration, and identify feasible potential projects that will address these issues while maintaining the corridor vision. Once UDOT develops a preliminary project list and statements of goals and objectives, it will sponsor another round of stakeholder and public workshops. The intent of these workshops will be to receive comments on the vision, goals, and objectives and on the preliminary project list. The final corridor report will consider comments received during this second round of workshops.

5.2 Issues Highlights

The following summarizes the highlights of information about issues gathered during the stakeholder and public activities described above. UDOT recognizes that these issues are not yet verified for accuracy and have yet to be evaluated to determine level of significance to corridor operations. Additional comments on issues are expected and will receive consideration as part of the final corridor report.

5.2.1 Safety

- Increasing traffic, especially trucks
- Car and large truck conflicts
- High vehicle speeds
- Merging, intersection, and access conflicts
- Insufficient capacity, which causes conflicts

- School bus stops on highway
- Bicycle and pedestrian issues; dangerous crossings in cities
- Wildlife strikes throughout corridor
- Livestock on roadway through Daniels Canyon

5.2.2 Congestion

- Delays from Duchesne to Jensen caused by lack of capacity
- Slow truck access and merging, which causes congestion
- Morning and afternoon peak hour (commute hour) congestion from Duchesne to Jensen
- Congestion between and through cities, which results in noise and pedestrian conflicts
- High volume and increasing truck traffic from oil and gas industry
- Anticipated community and corridor-wide growth and development
- Lack of transit (bus) services on the corridor
- Increasing conflicts with driveways in cities

5.2.3 Growth and Development Along the Corridor

- New and planned residential development, especially in and around the cities and near Strawberry Reservoir
- Non-residential development, such as:
  - Industrial (Naples)
  - Daniels Summit Lodge expansion
  - Utah State University in Vernal
  - Commercial development in cities

5.2.4 Intersection Conflicts

- Truck access point conflicts
  - SR 88, SR 87, SR 191, SR 45
  - Twelvemile Road (southwest of Vernal)
  - Pleasant Valley Road

  - Bridgeland Road (also known as East River Road, between Duchesne and Myton)
  - Bonanza Road (east of Jensen, outside of project area)
- City intersection conflicts throughout Roosevelt, Duchesne, Vernal , and Jensen
- Turning movement conflicts, including left turn conflicts with lack of protection from through traffic
- Merging conflicts (lack of protection from through traffic)

5.2.5 Roadway Design & Operation

- Passing lane conflict areas
- Insufficient lane capacity
- Narrow shoulders
- Lane restrictions
- Narrow bridges
- Insufficient (short) passing lanes
- Insufficient sight distance on hills
- Need to review existing striping; roadway striping is difficult to see at night
- Insufficient intersection geometrics for truck turning movements
- Roadway damage from large trucks

5.2.6 Environmental

- Wildlife crossings and wildlife strikes throughout corridor
- Water resource concerns: uncontrolled stormwater runoff; potential effects to water district facilities and water delivery throughout the corridor
- Drainage: insufficient drainage systems; highway drainage incompatible with city systems
- Hazardous Materials: hazardous materials in and leaking from trucks; incorrect placard use to identify hazardous materials

- Wetlands: from Bridgeland to Myton
- Air quality: road dust and dirt from trucks through cities
- Noise: truck noise through cities

5.2.7 Other Issues

- Potential impacts to tribal lands from Bridgeland through Myton
- Lack of beautification through cities
- Overuse of USFS toilets at recreation sites

5.3 General Issues Priorities

At the stakeholder workshops described above, participants were invited to name and prioritize what they believed were the most important issues that UDOT should consider as it plans for the future of U.S. 40. The top three issues identified at each stakeholder meeting location are as follows:

Vernal

1. Congestion
2. Intersections
3. Roadway design

Roosevelt

1. Safety
2. Congestion
3. Roadway design

Heber City

1. Safety
2. Reduced congestion
3. Improved roadway design

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7.0 Appendices

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Appendix A. Recent Surface Treatments to the U.S. 40 Project Corridor

			Last Major Construction		Last Treatment		Planned and Future Treatments	
Location	**BMP**	**EMP**	**Type**	**Year**	**Type**	**Year**	**Type**	**Year**
Jct. SR-189 to Clegg Cyn.	18.08	27.71	Asphalt New Construction	2002	new pavement structure	2002	surface seal	2008
							surface rejuvenation	2012
							structural overlay	2016
							surface seal	2017
Clegg Cyn. to Daniels Summit	27.71	34.54	Asphalt New Construction	2001	surface seal	2002	structural overlay	2007
							surface seal	2008
							surface rejuvenation	2012
							surface seal	2016
Daniels Summit to Strawberry Maintenance Shed	34.54	41.39	Asphalt New Construction	1998	surface seal	2004	structural overlay	2009
							surface seal	2010
							surface rejuvenation	2014
							surface seal	2018
Strawberry Maintenance Shed to Soldier Creek Dam	41.39	50.78	Asphalt New Construction	1998	surface seal	2004	structural overlay	2010
							surface seal	2011
							surface rejuvenation	2015
							surface seal	2019
Soldier Creek Dam to Wasatch/Duchesne County Line	50.78	58.69	Asphalt New Construction	1998	surface rejuvenation	2005	surface seal	2008
							structural overlay	2012
							surface seal	2013
							surface rejuvenation	2017
Wasatch/Duchesne County Line to Jct. SR-208	58.89	68.25	Asphalt New Construction	1978	structural overlay	2002	surface seal	2008
							surface rejuvenation	2012
							surface seal	2016
							structural overlay	2020
Jct. SR-208 to Duchesne Western City Limit	68.25	85.85	Asphalt New Construction	1996	surface seal	2002	surface seal	2008
							surface rejuvenation	2012

			Last Major Construction		Last Treatment		Planned and Future Treatments	
Location	**BMP**	**EMP**	**Type**	**Year**	**Type**	**Year**	**Type**	**Year**
							surface seal	2016
							structural overlay	2020
Duchesne Western City Limit to Eastern City Limit	85.85	86.8	Asphalt New Construction	1994	surface rejuvenation	2003	surface seal	2008
							surface rejuvenation	2012
							surface seal	2016
							structural overlay	2020
Eastern City Limit to Antelope Creek Bridge	86.8	97.21	Asphalt New Construction	1994	structural overlay	2003	surface seal	2009
							surface rejuvenation	2013
							surface seal	2017
							structural overlay	2021
Antelope Creek Bridge to MP 97.693	97.21	97.69	Asphalt New Construction	1998	structural overlay	2003	surface seal	2009
							surface rejuvenation	2013
							surface seal	2017
							structural overlay	2021
MP 97.693 to Myton	97.69	105.37	Asphalt New Construction	1998	structural overlay	2003	surface seal	2009
							surface rejuvenation	2013
							structural overlay	2017
							surface seal	2018
Myton to Jct. SR-87/Ioka Lane	105.37	109.49	Asphalt New Construction	1998	structural overlay	2003	surface seal	2009
							surface rejuvenation	2013
							structural overlay	2017
							surface seal	2018
Jct. SR-87/Ioka Lane to Duchesne/Uintah County Line	109.49	115.21	Asphalt New Construction	1993	surface rejuvenation	2004	structural overlay	2008
							surface seal	2009
							surface rejuvenation	2013
							surface seal	2017
Duchesne/Uintah County Line	115.21	121.69	Asphalt New Construction	1994	structural overlay	2005	surface seal	2011

			Last Major Construction		Last Treatment		Planned and Future Treatments	
Location	BMP	EMP	Type	Year	Type	Year	Type	Year
to old RP 123							surface rejuvenation	2015
							structural overlay	2019
							surface seal	2020
Old RP 123 to Jct. SR-88	121.69	130.45	Asphalt New Construction	1994	structural overlay	2005	surface seal	2011
							surface rejuvenation	2015
							surface seal	2019
							structural overlay	2023
Jct. SR-88 to Vernal Southern City Limit	130.45	141.46	Asphalt New Construction	1997	structural overlay	2005	surface seal	2011
							surface rejuvenation	2015
							structural overlay	2019
							surface seal	2020
Vernal Southern City Limit to Naples North City Limit	141.46	145.87	Asphalt New Construction	1992	surface seal	2003	surface seal	2009
							surface rejuvenation	2013
							structural overlay	2017
							surface seal	2018
Naples North City Limit to 9000 East	145.87	156.6	Asphalt New Construction	1997	structural overlay	2005	surface seal	2011
							surface rejuvenation	2015
							surface seal	2019
							structural overlay	2023
9000 East to Old RP 160	156.6	158.62	Asphalt New Construction	1997	surface seal	2005	surface seal	2011
							structural overlay	2015
							surface seal	2016
							surface rejuvenation	2020

Source: UDOT 2007b

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Appendix B. Current Bridge Ratings for the U.S. 40 Corridor Study Area

Structure Number	Bridge	Beginning Milepost	Sufficiency Rating	Bridge Condition
E-2017	Strawberry River Bridge	36.9	80	Good
F-602	Currant Creek Bridge	58.1	80	Good
D-595	Red Creek Bridge	65	43.3	Poor
D-592	Bridge over Sand Wash	66.5	62	Fair
C-560	Starvation Reservoir Bridge	81.1	82.7	Good
F-265	Strawberry River Bridge	85.7	84.8	Good
F-62	Strawberry River Bridge	87.2	81.3	Good
E-1293	Grey Mountain Canal Bridge	95.6	80.3	Good
F-690	Antelope Creek Bridge	97.2	96.7	Very Good
E-966	Bridgeland Myton Wash Bridge	100.2	87.9	Good
C-794	Duchesne River Bridge	105.3	95.9	Very Good
E-1096	Dry Gulch Canal	106.3	79.1	Fair
V-1695	Dry Gulch Canal	110.5	87.6	Good
D-593	Cottonwood Creek	114.6	75.2	Fair
D-658	Pipe over Highway 40	118.4	60	Fair
C-321	Uintah River Bridge	121.6	91.2	Good
E-1158	Bridge over Sand Wash	129.5	95.1	Very Good
E-1499	Halfway Hollow Wash Bridge	130.9	91.7	Good
E-1500	Twelve Mile Wash Bridge	133.7	90.7	Good
D-828	Steinaker Canal Bridge	142.6	84.4	Good
F-593	Ashley Creek Bridge	153.7	96.6	Very Good

Source: UDOT 2007c

APPENDIX A:

U.S. 40 Corridor Study Crash History and Analysis

U.S. 40 Corridor Study Crash History and Analysis

in support of the
U.S. 40 Corridor Study

MP 21 in Wasatch County to MP 147 in Uintah County, Utah

Utah Department of Transportation

Project No. S-0040(65) 21

Prepared by
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June 2007

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1.0 Introduction

1.1 Crash History and Analysis

One of the most fundamental ways that transportation investments can enhance quality of life is by making it possible for people to move about the state in relative safety. While it will never be possible to remove all risk involved in moving people or goods, it is an important public policy objective to identify particularly high-risk circumstances and address them as comprehensively as possible.

Improving highway safety requires consideration of the three elements influencing traffic operations: the driver, the vehicle, and the roadway. Although traffic engineers have effective control over only one of these elements—the roadway—from the planning perspective policies could be implemented to address better information outreach and behavior. Traffic safety can be approached in a number of different ways: reducing crash occurrences, reducing the severity of crashes, improving crash survivability, enforcing safety control efforts, and improving design aspects of the road. Both physical alterations and social policies should be considered to enhance safety in the corridor.

This technical memorandum presents an analysis of 5 years of crash data obtained from Utah Department of Transportation (UDOT) Office of Traffic and Safety.

1.2 Study Area

This study encompasses a specific area along U.S. 40 through Wasatch, Duchesne, and Uintah Counties in Utah. The study corridor begins in the west at Mile Post (MP) 21.4, roughly the mouth of Daniels Canyon, and ends approximately 135 miles to the east at MP 157.1, at the edge of Jensen. The study corridor is shown in Figure 1.

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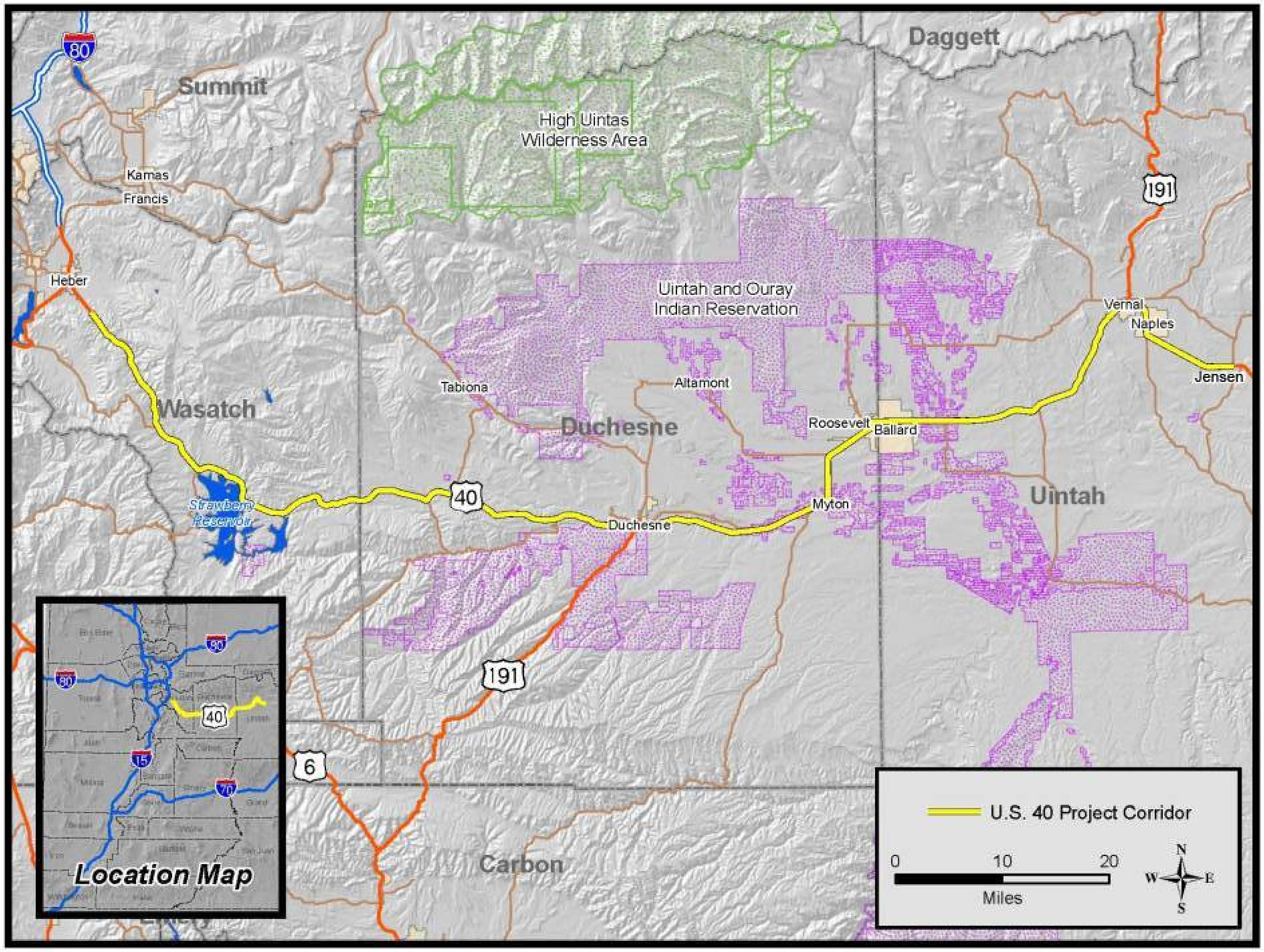
Figure 1. Study Area Map



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The UDOT crash database provides a variety of information about each reported crash. At times, not all information is provided for each crash in each location. Crash data are provided by the police officers called to the scene and depend on the specifics of each report. The information generally includes:

- Location by milepost (as estimated by reporting officer)
- Crash severity and number of fatalities and injuries
- Number and type of vehicles
- Driver's action for each vehicle involved
- Type of collision
- Location in relation to intersection and roadway
- Contributing circumstances
- Weather, roadway surface, and light conditions
- Day of week, hour of day, and date of crash

The first section of the document includes the main findings and overall crash statistics. Subsequent sections present the information using the following structure:

Corridor's Crash Statistics
Crash History
Crash Rates
Crash Severity
Costs

Where and When
Crash Frequency and Location
Relation to Junction
Crashes by Month

Vehicles, Conditions, and Events
Number of Vehicles Involved
Roadway Surface Condition
Type of Vehicle Involved
Type of Collision
Type of Accident

Drivers and Circumstances
Driver's Age
Contributing Circumstances

2.0 Main Findings

- The number of crashes increased significantly in 2004–2005 over 2001–2003.
- The crash rate was above the statewide average for the rural sections of the corridor for the last 3 years of the study.
- The majority of the crashes (84%) occurred on a dry roadway surface.
- Failure to yield right-of-way (16%), improper lookout (15%), and maintaining too fast a speed (15%) were the three main contributing circumstances.
- Collision with a moving vehicle was the most frequent crash occurrence (40%) and the most frequent fatal crash occurrence (73%).
- Wild animals were involved in 32% of crashes in the study corridor.* Wild-animal-related incidents were not clustered in one particular area, but occurred regularly throughout the corridor.
- After maintaining too fast a speed (17%), failure to yield (11%) was the most common contributing circumstance to fatal crashes.
- Only one out of every four crashes was at an intersection or intersection-related.
- Young drivers (age 15–19) constitute a disproportionately high percentage of all drivers involved in crashes in the corridor. Drivers in this age group had 16% of the crashes in the study corridor.

* May be higher, since many wild animal collisions go unreported.

3.0 Crash Statistics and Rates

Crash data were obtained for the years 2001 through 2005. The data reflect the crashes where accident reports were completed and do not include or purport to estimate unreported crashes that may have occurred during the analysis period.

3.1 Crash History

As shown in Table 1, there were 2,054 crashes in the U.S. 40 corridor study area during the 5-year analysis period. A total of 3,020 vehicles were involved.

2004 and 2005 saw a nearly 20% increase in crashes annually over 2001–2003. The average annual number of crash-related fatalities doubled from 2001 to 2002 and then stayed level for the rest of the study period.

Table 1. Crash History by Year for U.S. 40 Corridor, 2001–2005

Year	Number of Crashes									Persons Involved in Crashes		
	Total	Fatal		Injury*		Possible Injury		PDO		Fatalities	Injuries*	Total
2001	388	4	1.0%	59	15.2%	43	11.1%	282	72.7%	5	103	911
2002	387	8	2.1%	82	21.2%	39	10.1%	258	66.7%	13	137	995
2003	382	7	1.8%	77	20.2%	43	11.3%	255	66.8%	9	131	846
2004	452	7	1.5%	77	17.0%	46	10.2%	322	71.2%	8	128	1035
2005	445	7	1.6%	79	17.8%	42	9.4%	317	71.2%	9	123	1091
Total	**2054**	**33**	**1.6%**	**374**	**18.2%**	**213**	**10.4%**	**1434**	**69.8%**	**44**	**622**	**4878**

Source: HDR, UDOT Office of Traffic and Safety

* *Includes Bruises and abrasions (code 3) and Broken bones or bleeding wounds (code 4) / Possible Injuries (code 2) not included. - PDO= Property Damage Only*

Fatal crashes accounted for approximately 1.6% of all crashes. Overall, there were 33 fatal crashes resulting in 44 fatalities. Injury crashes accounted for approximately 18.2% of all crashes, with 374 crashes resulting in 622 injuries of varying severity. Crashes with property damage only (PDO) accounted for approximately 70% (1,434) of all crashes.

3.2 Crash Rates

UDOT maintains annual crash rate information for different types of roadways throughout the state. The crash rate calculation takes into account the characteristics of the roadway including number of travel lanes, access control, type of median, roadway width, and average annual daily traffic (AADT) volumes. It is based on the millions of vehicle-miles traveled.

The accident rate data for the U.S. 40 corridor have been divided into two groups for this study based on the functional classifications of U.S. 40. The section of U.S. 40 that passes through Vernal and Naples, from MP 141.46 to MP 148.24, is listed by UDOT as “other small urban area principal arterial,” whereas the remainder of the corridor is “other rural principal arterial.” While AADT does rise as the corridor passes through Roosevelt, that area has not been reclassified from rural by UDOT and so is considered as rural for the purposes of this study.

Table 2 compares the local accident rate to the state average accident rates for these functional classes. The accident rate reflects the number of accidents that occur in a segment per 1 million vehicle-miles traveled. In both the rural and small urban areas, the average accident rate over the 5-year study period was lower than the state average.

Table 2. Average Accident Rates in the Study Area and Across the State, 2001–2005

	Accident Rates (per 1 MVM)	
Functional Class	**US 40 Corridor**	**Utah Statewide Average**
Rural Principal Arterial-Other, AADT < 5000	1.35	1.46
Small Urban Principal Arterial-Other, AADT 20000	2.06	3.53

Source: HDR, UDOT Office of Traffic and Safety

Yet 2002 was the only year in which the rural accident rate, at 1.33, was much lower than the state average (Table 2). Without the low rate achieved that year, the average would have been 1.54, over the state average for similar roadways.

Table 3 also shows that 2001 was an extraordinarily low year for crashes in the Vernal-Naples area. Unlike the rural data, however, even without the lowest crash rate figured in, the area is still below the state average.

In general, the yearly data reflect a trend toward higher crash rates in both rural and small urban segments. The rural crash rate should be especially concerning, as it has been steadily above the state average since 2002.

Table 3. Accident Rates by Year for the U.S. 40 Corridor, 2001–2005

	Accident Rates (per 1 MVM)					Utah Average
Functional Class	2001	2002	2003	2004	2005	
Other Rural Principal Arterial, AADT < 5000	1.45	1.33	1.52	1.71	1.49	1.46
Other Small Urban Principal Arterial, AADT >20000	1.62	2.52	2.43	2.28	2.51	3.53

Source: HDR, UDOT Office of Traffic and Safety

3.3 Severity Rates

UDOT uses accident severity rates to compare the intensity of injury occurring during crashes among segments of road of the same functional classification. This rate assigns crashes a point value commensurate with their severity and then averages the total severity score by the number of crashes.

Table 4 lists the severity rates for the two sections of the study corridor as well as the average statewide severity rate for like roads. In both cases, the crashes along the study corridor tend on average to result in less severe injuries than they do across the state.

Table 4. Average Accident Severity Rates in the Study Area and Across the State, 2001–2005

	Severity Rates	
Functional Class	**US 40 Corridor**	**Utah Statewide Average**
Rural Principal Arterial-Other, AADT < 5000	1.63	1.7
Small Urban Principal Arterial-Other, AADT 20000	1.56	1.62

Source: HDR, UDOT Office of Traffic and Safety

Table 5 presents the severity rate data by year. Both sections of the corridor had severity rates higher than the state average in 2002. The rural severity rate may be inflated by the drop in rural accidents that year. For both sections, though, the severity rate spiked in 2002 and has slowly fallen each year since.

Table 5. Severity Rates by Year for the U.S. 40 Corridor, 2001–2005

	Severity Rate					
Functional Class	2001	2002	2003	2004	2005	Utah Average
Other Rural Principal Arterial, AADT < 5000	1.55	1.71	1.69	1.58	1.62	1.7
Other Small Urban Principal Arterial, AADT >20000	1.52	1.68	1.57	1.62	1.44	1.62

Source: HDR, UDOT Office of Traffic and Safety

3.4 The Cost of Crashes

The Federal Highway Administration (FHWA) has assigned monetary values for each level of crash severity. These values attempt to quantify the various costs to the public—property damage, hospitalization for injury, and loss of life among them—resulting from unsafe passages. This value is one measure of the cost of not making needed improvements to a roadway.

Table 6 calculates the cost of crashes on the U.S. 40 corridor. From 2001 to 2005 the equivalent of $169 million was lost through accidents on this corridor. Based on this data, crashes cost the public $33.8 million annually on this stretch of highway alone.

Table 6. Costs of Crash Incidents, 2001–2005

Accident Severity	PDO	Possible	Evident	Incapacitating	Fatal	Grand Total
Number of accidents 2001-2005	1434	213	214	160	33	2054
Cost per incident*	2,616	24,854	47,092	235,458	3,401,059	
Total cost, in millions of dollars	3.8	5.3	10.1	37.7	112.2	**169.0**

Source: HDR, UDOT Office of Traffic and Safety, *FHWA

Figures 2 through 5 map the location of each accident described in this section by its severity. Fatalities are more prevalent toward the mountains and canyons of the west than the urban area to the east. (While the FHWA uses separate measures for Evident and Incapacitating injuries, this study refers only to injury crashes.) For ease of reference, the corridor was broken into four sections for mapping in this document.

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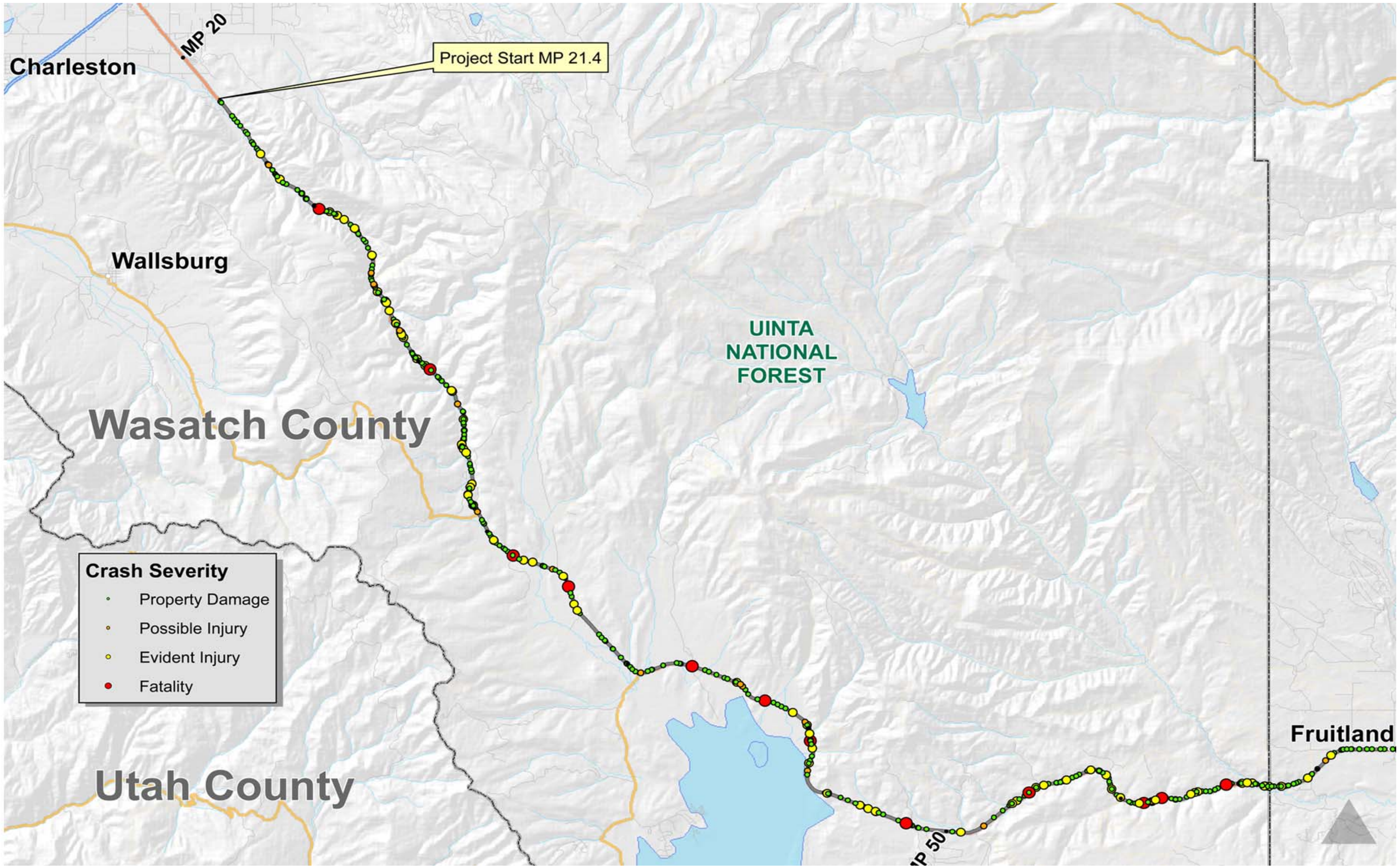


Figure 2. Accidents by Location and Severity, 2001-2005, Map 1

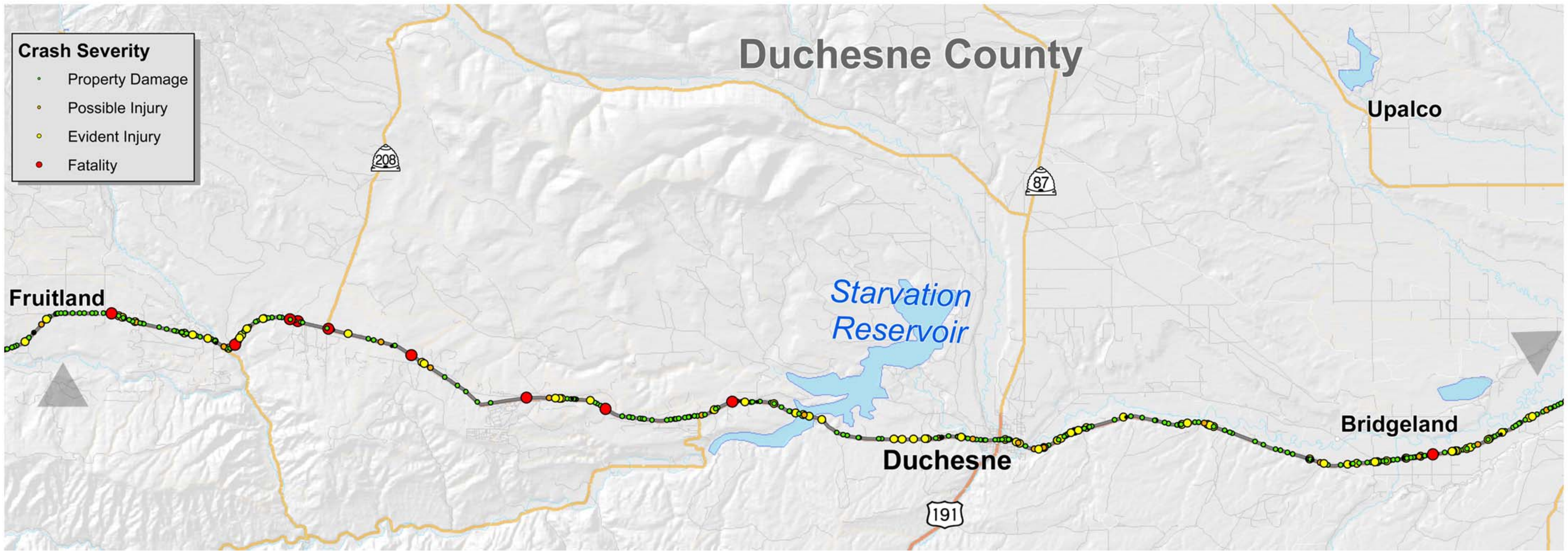


Figure 3. Accidents by Location and Severity, 2001–2005, Map 2

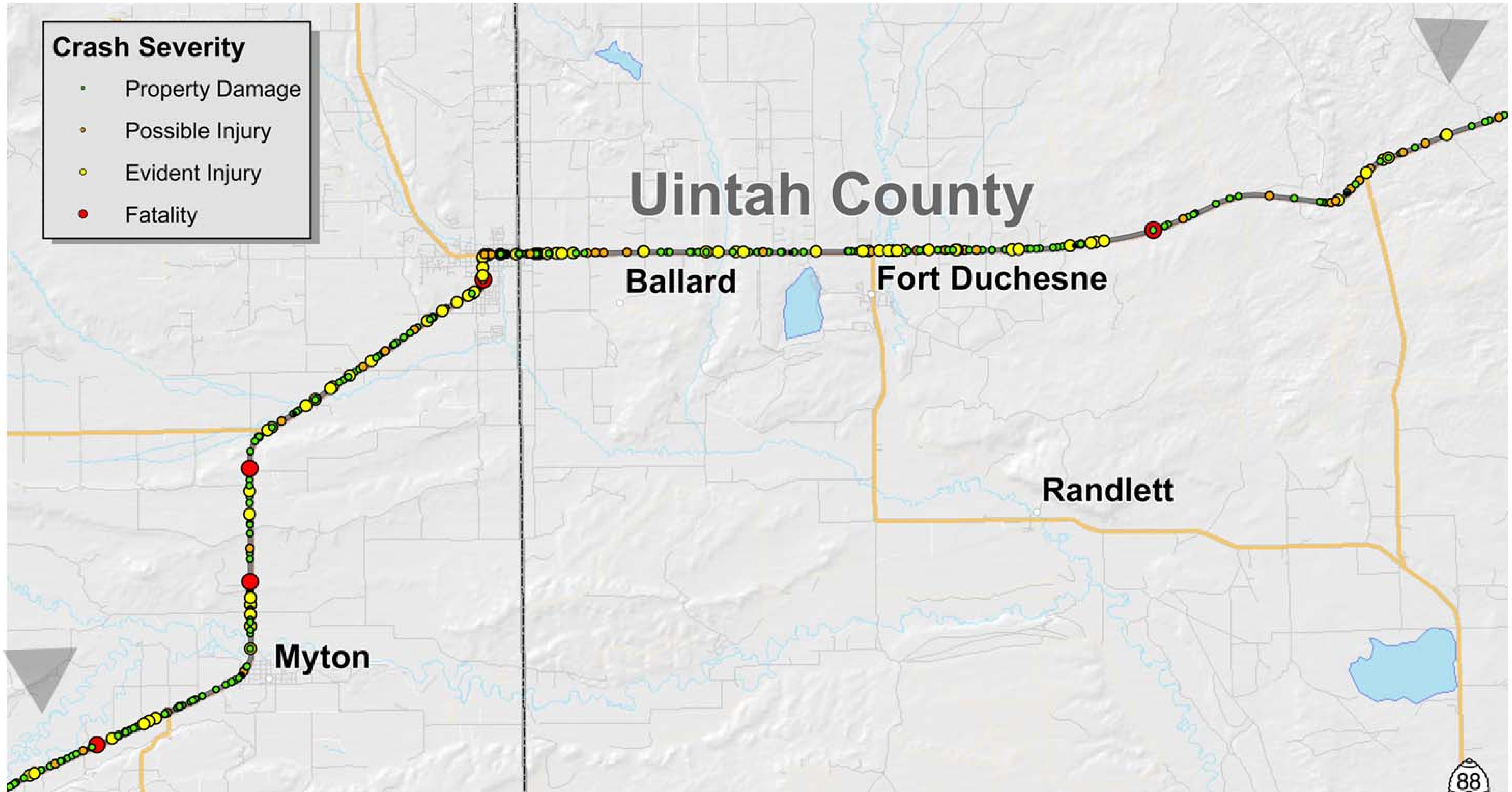


Figure 4. Accidents by Location and Severity, 2001–2005, Map 3

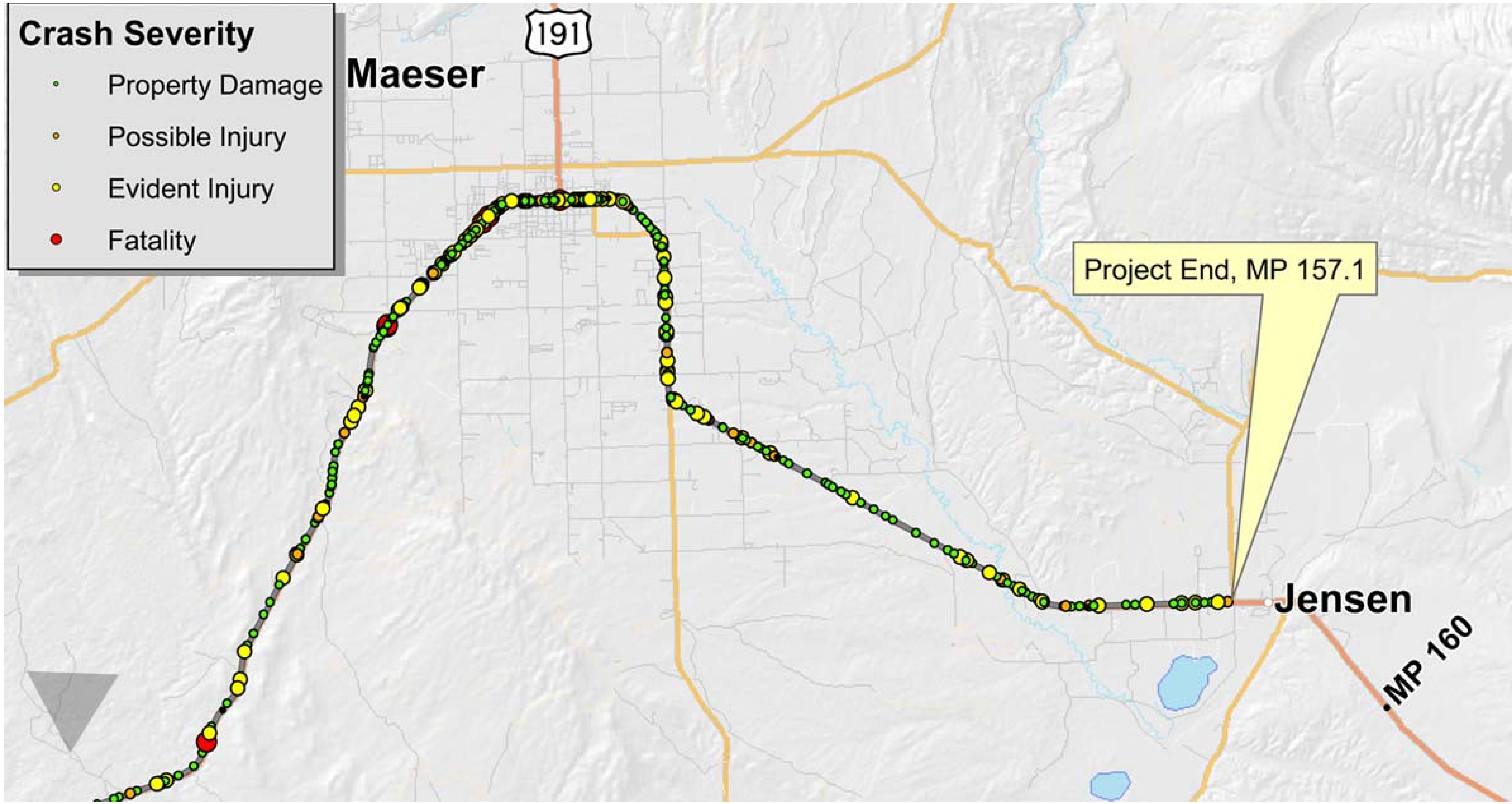
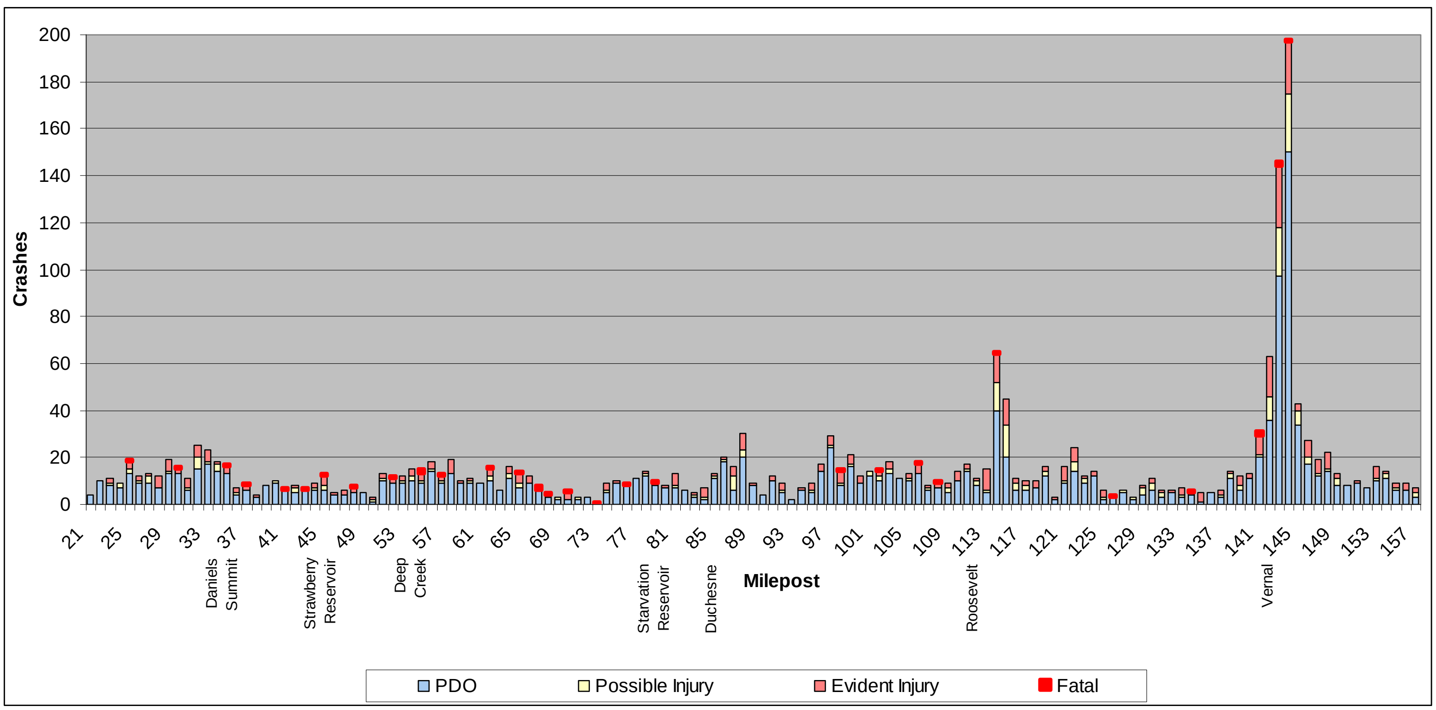


Figure 5. Accidents by Location and Severity, 2001–2005, Map 4

4.0 Where and When

There is a notable increase in crashes in the urbanized areas, particularly Vernal (Figure 6). Areas of urbanization as these typically have higher traffic volumes, and a greater number of intersections and access roads, making crashes more likely than in rural areas. The area in Vernal that relates to the highest crash incidents is around the downtown. This is to be expected given the higher traffic volumes and the series of signals that controls traffic in the downtown.

Figure 6. Crash Frequency and Location



Source: HDR, UDOT Office of Traffic and Safety

4.1 Junctions

The area formed when two roadways meet is referred to as a “junction.” Junctions include intersections, interchanges, and entrance/exit ramps. As can be seen in Table 7, crashes occurring within the U.S. 40 corridor study area are not highly related to junctions. Over three-quarters of the total number of crashes along this corridor are not junction-related (1,561).

Table 7 shows the crash data in terms of junction involvement. Those crashes which occurred at junctions were over three times more likely to have happened at four-way stops than at T-style intersections (374 crashes versus 119). Four-way-stop intersections prove particularly hazardous in the urbanized areas: around MP 86 in Duchesne, from MP 99 to MP 106 through Myton, MP 111 to MP 116 through Roosevelt, and MP 140 to MP 150 through Vernal.

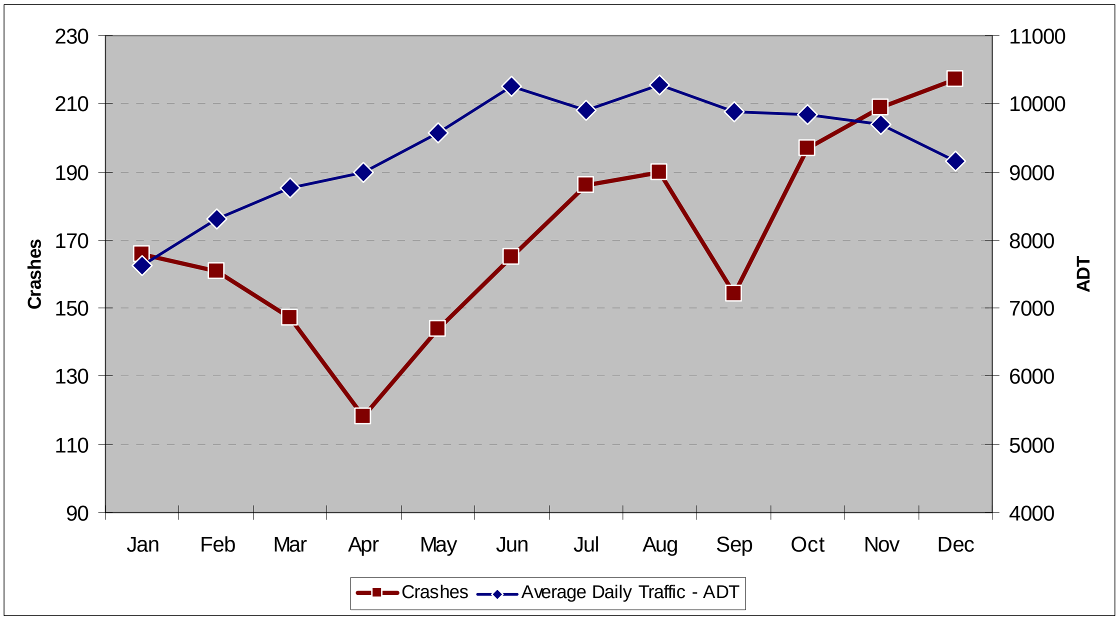
Table 7. Crash History by Relationship to Junction by Severity, 2001–2005

Relation to Junction	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Nonjuction	1561	76%	26	79%	254	68%	150	70%	1131	79%
4 Way Intersection	374	18%	6	18%	83	22%	47	22%	238	17%
T Intersection	119	6%	1	3%	37	10%	16	8%	65	5%
Total	**2054**		**33**		**374**		**213**		**1434**	

Source: HDR, UDOT Office of Traffic and Safety

Figure 7 displays the crash data by month of the year. In August, during the peak summer driving season, the average annual daily traffic (AADT) in the corridor study area is 10,273 vehicles a day. That is an increase of 2,500 vehicles per day over the month of lowest use, January, which sees 7,624 vehicles a day.

Figure 7. Crash History and Average Annual Daily Traffic by Month, 2001–2005



Source: HDR, UDOT Office of Traffic and Safety, UDOT Planning Statistic Section

Crashes: Total Number between 2001 and 2005

ADT: Average Daily Traffic in 2006 recorded by Automatic Recorder 425 – MP 111.56

According to Figure 7, crashes are influenced by both traffic and poor weather. August may have the highest AADT, but it has only the fourth-highest average crash rate because the roads stay clear in the hot weather. Instead, crashes spike in November and December, during which poor winter road conditions combine with heavy holiday road use to contribute to crashes. Those months with low AADT and fair conditions, such as April and September, see the fewest crashes in this corridor.

5.0 Vehicles, Conditions, and Events

Table 8 puts the crash data in terms of crash severity and number of vehicles involved. While most accidents involved just one car, those involving two cars were more likely to result in injury or fatality. For fatal crashes, 86% of incidents involved two vehicles (24); 21% involved a single vehicle (6). For crashes involving Property Damage Only (PDO), a single vehicle was involved in 61% of the crashes (879); two vehicles, 37% (525).

Table 8. Crash History by Number of Vehicles Involved, 2001–2005

Number of Vehicles Involved	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
1	1155	56%	6	21%	184	49%	86	40%	879	61%
2	827	40%	24	86%	166	44%	112	53%	525	37%
3	67	3%	2	7%	23	6%	14	7%	28	2%
4 or more	5	0%	1	4%	1	0%	1	0%	2	0%
Total	**2054**		**28**	**1%**	**374**	**18%**	**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Table 9 describes the road conditions at the time of each crash. Most crashes (84%) occurred on dry roads, with just 7% taking place in wet conditions and 5% in snow. While snowy, wet, and icy conditions contributed to 16% of all crashes, they contributed to 39% of fatal accidents. This suggests that weather contributes to the severity of crashes in the corridor more than their likelihood of occurring.

Table 9. Crash History by Roadway Surface Condition, 2001–2005

Roadway Surface Condition	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Dry	1706	84%	20	61%	309	84%	165	77%	1212	85%
Wet	150	7%	7	21%	21	6%	28	13%	94	7%
Snowy	98	5%	5	15%	22	6%	7	3%	64	4%
Ice	79	4%	1	3%	16	4%	11	5%	51	4%
Oily	2	0%	-	-	-	-	1	0%	1	0%
Unknown	2	0%	-	-	-	-	1	0%	1	0%
Total	**2037**		**33**	**2%**	**368**	**18%**	**213**	**10%**	**1423**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

As can be seen from Figure 8 through Figure 11, mountainous conditions and high altitudes combined to make some particularly dangerous areas for winter driving. The stretch from MP 25 to MP 34, the western approach to Daniels Summit, saw many crashes due to snowy and icy conditions. So did the area around Deep Creek, MP 54 to MP 58. After Deep Creek, ice and snow were less often a factor in crashes, except for in urban areas and around MP 130 and MP 155, on either side of Vernal.

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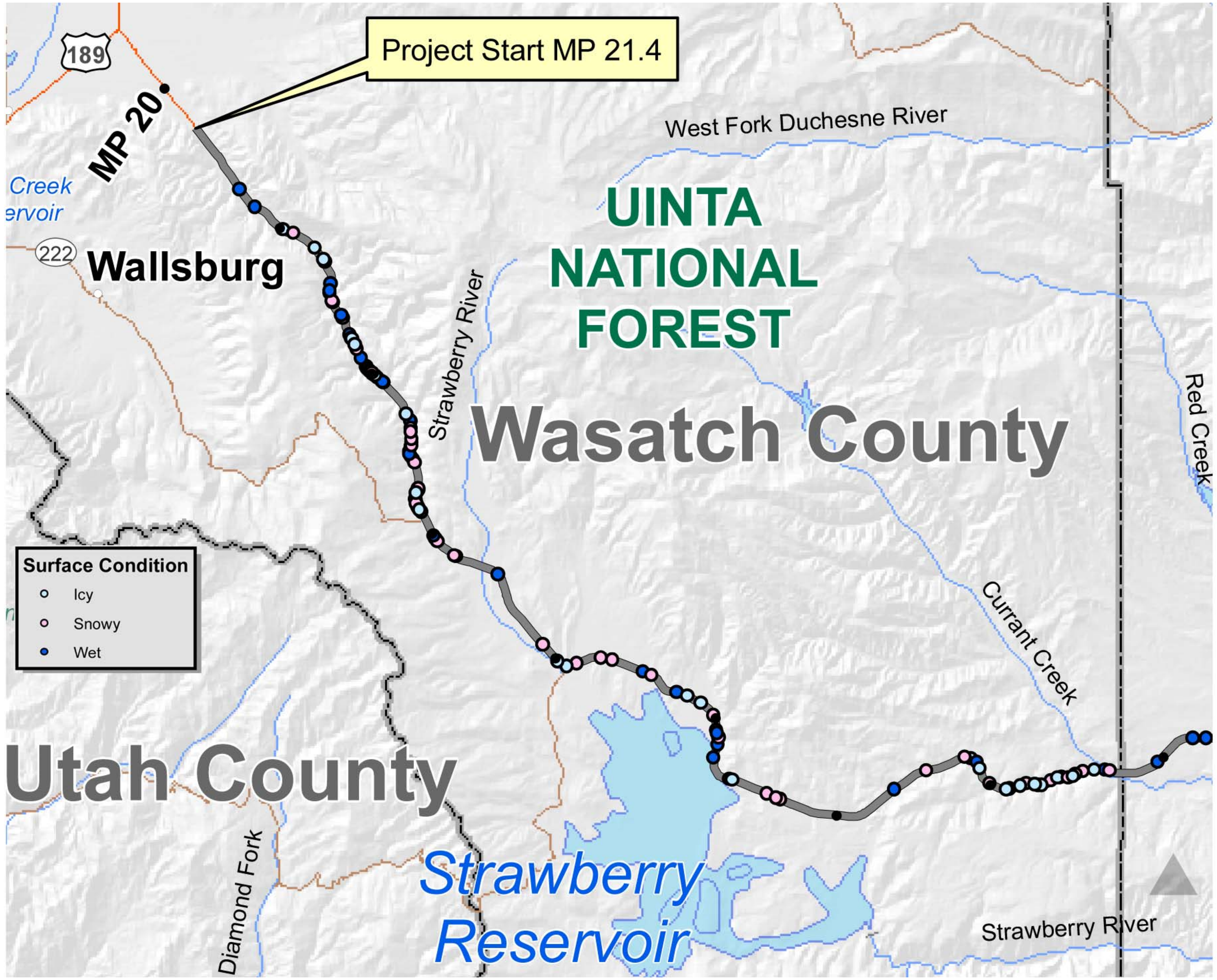

Figure 8. Accidents by Surface Conditions, 2001–2005, Map 1

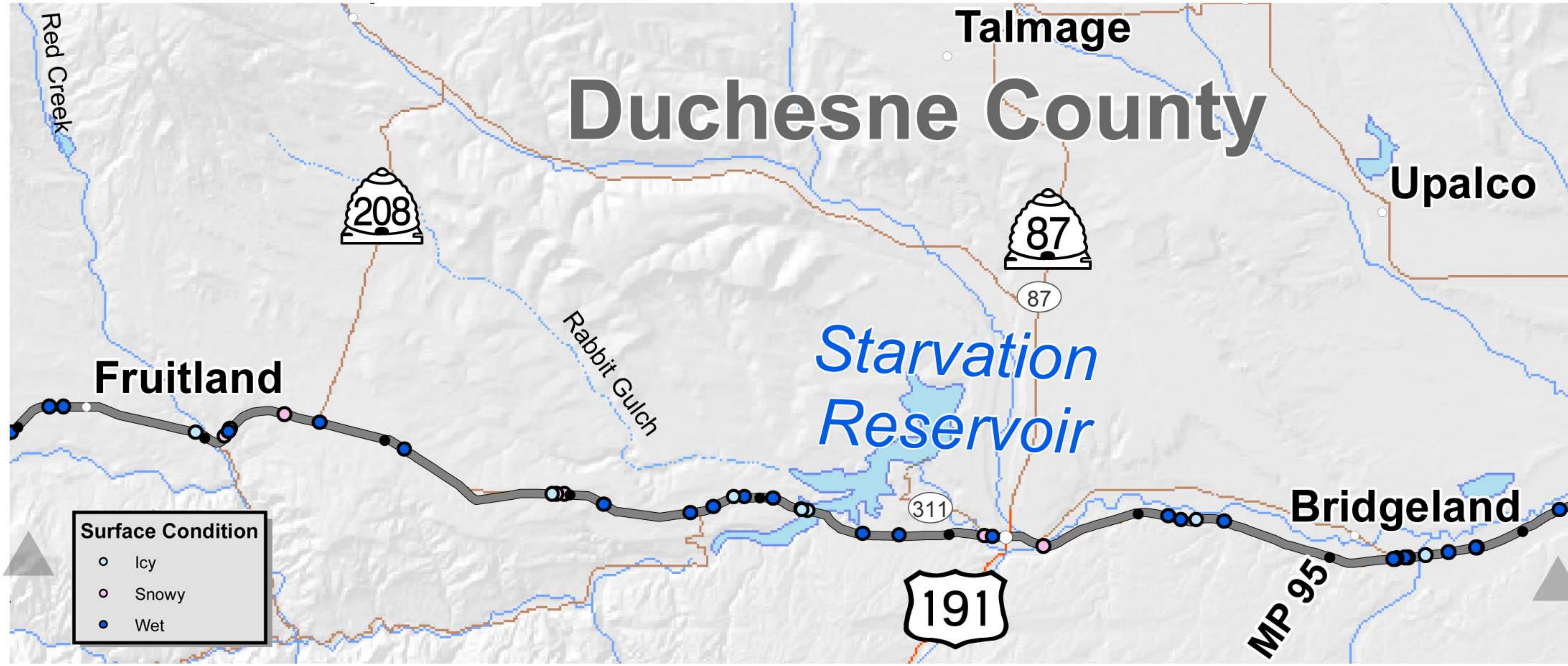

Figure 9. Accidents by Surface Conditions, 2001--2005, Map 2

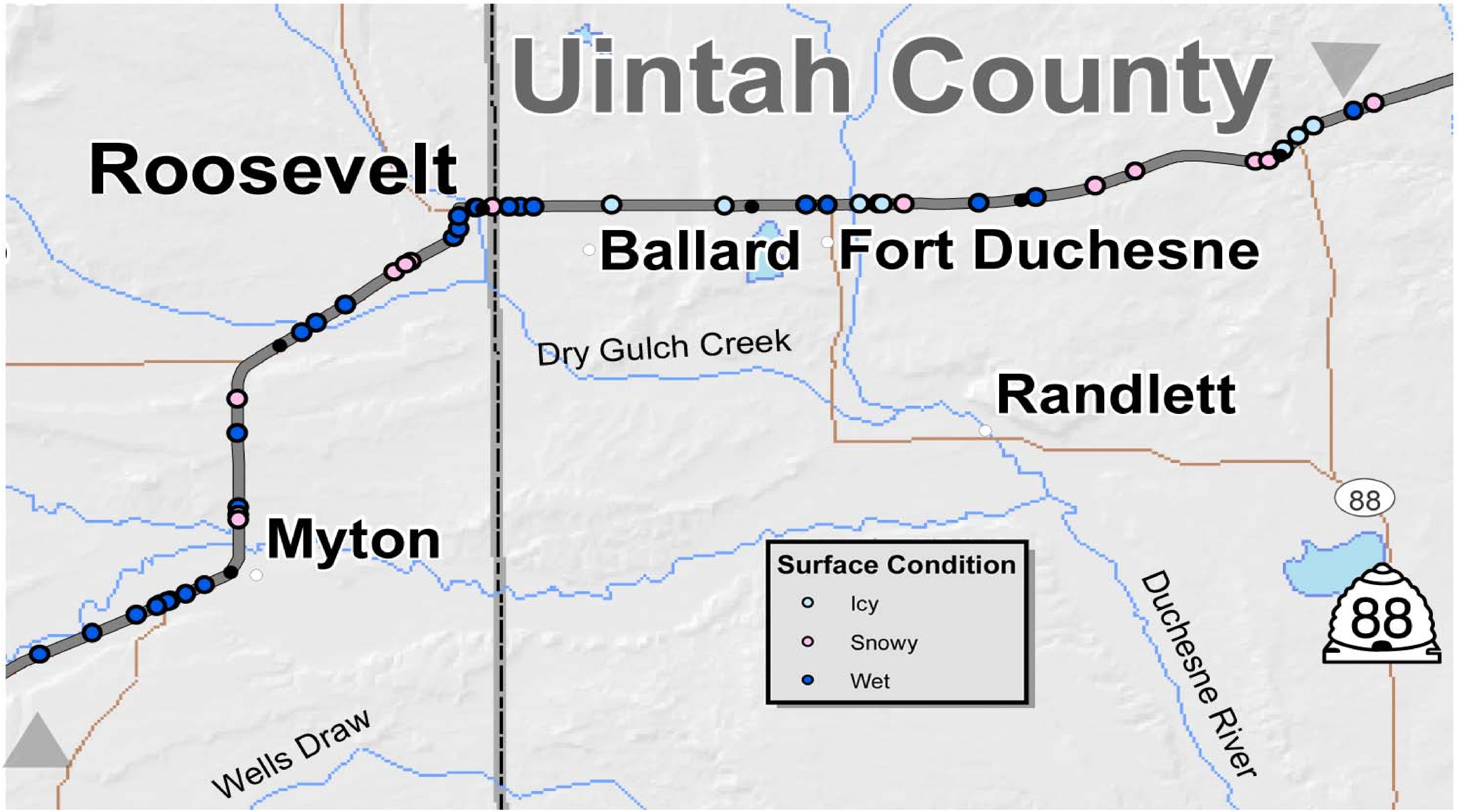

Figure 10. Accidents by Surface Conditions, 2001–2005, Map 3

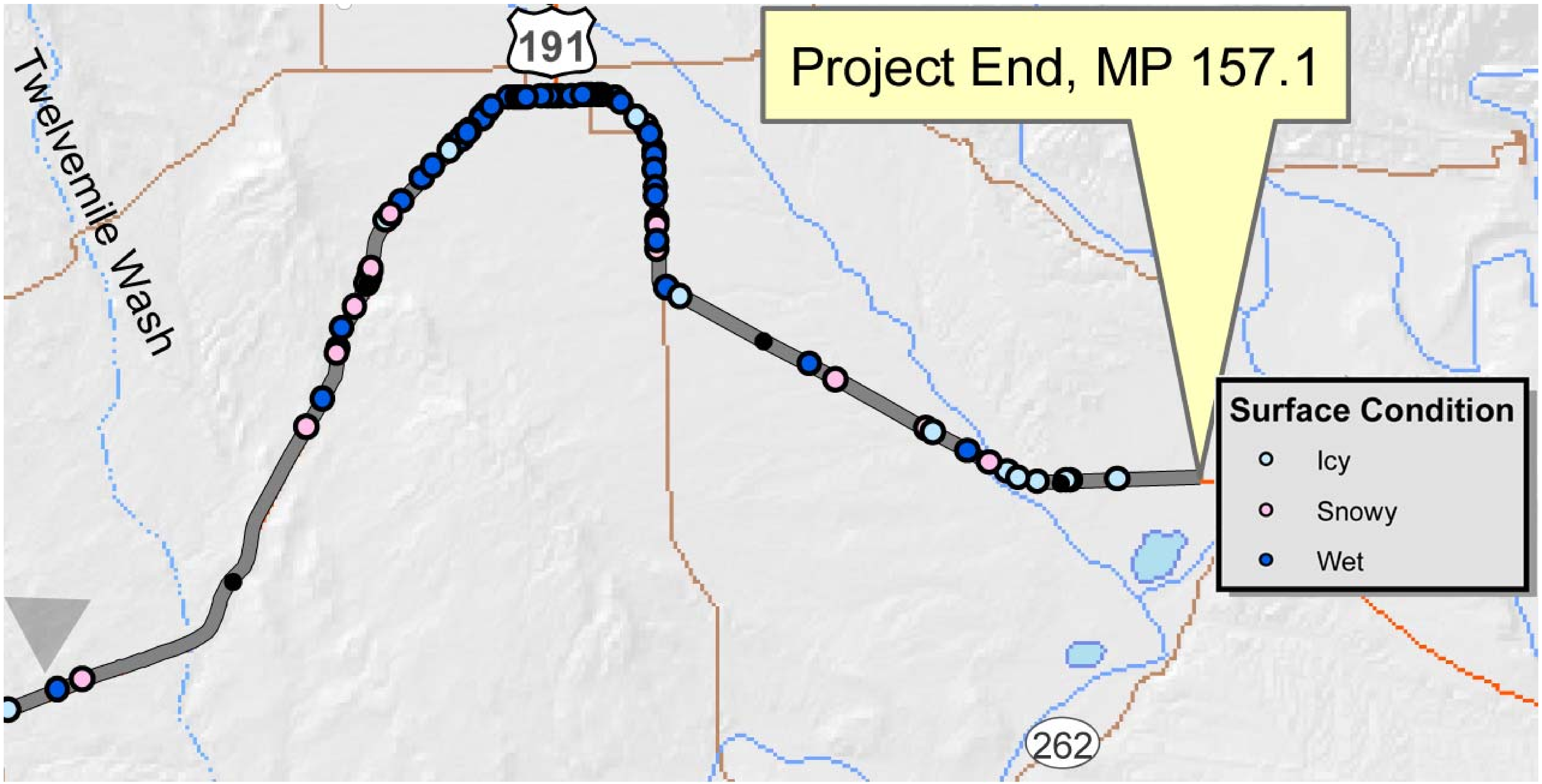

Figure 11. Accidents by Surface Conditions, 2001–2005, Map 4

Table 10 displays the crash data by crash severity and vehicle type. From this table it is evident that the severity of injury resulting from an accident is dependent in part upon the type of vehicle(s) involved. For example, motorcycles, although they made up only 1% of all crashes (31), accounted for 6% of fatal crashes (4). Pickups and SUVs made up almost half (47%, or 1,430) of the automobiles involved in crashes, but just over one-third (35%) of those involved in fatal accidents.

Table 10. Crash History by Type of Vehicle, 2001–2005

Type of Vehicles Involved	Number of Vehicles Involved by Crash Severity									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Pickup/SUV	1430	47%	22	35%	249	41%	162	45%	997	50%
Passenger Car	1234	41%	28	44%	262	43%	161	45%	783	39%
Pickup/SUV & Other Trailer	47	2%	1	2%	9	1%	5	1%	32	2%
Tractor & Long Trailer	39	1%	2	3%	9	1%	3	1%	25	1%
Motorcycle	31	1%	4	6%	21	3%	4	1%	2	0%
Truck & Trailer	20	1%	1	2%	2	0%	2	1%	15	1%
Publicly Owned Passenger Car	19	1%	0	0%	3	0%	4	1%	12	1%
Pickup/SUV & House Trailer	18	1%	0	0%	2	0%	1	0%	15	1%
Enclosed Box Single Unit Truck	18	1%	1	2%	3	0%	2	1%	12	1%
Tractor & Short Trailer	18	1%	0	0%	4	1%	2	1%	12	1%
Hit & Run	17	1%	0	0%	9	1%	3	1%	5	0%
Tractor - Long trailer - Short Trailer	16	1%	1	2%	4	1%	2	1%	9	0%
Publicly Owned Pickup/SUV	10	0%	0	0%	1	0%	2	1%	7	0%
Pickup/SUV & Boat	9	0%	0	0%	3	0%	0	0%	6	0%
Truck & Trailer: Cab Only	9	0%	0	0%	3	0%	1	0%	5	0%
Pickup with Vehicle in Tow	9	0%	0	0%	8	1%	0	0%	1	0%
Motorhome	8	0%	0	0%	1	0%	1	0%	6	0%
Flatbed/Tow Truck	8	0%	0	0%	0	0%	0	0%	8	0%
Special Equipment (e.g. Fire Trucks)	7	0%	0	0%	3	0%	1	0%	3	0%
Tractor & 2 Trailers	7	0%	1	2%	0	0%	0	0%	6	0%
ATV/Snowmobile	5	0%	2	3%	1	0%	2	1%	0	0%
Dump Truck	5	0%	0	0%	2	0%	0	0%	3	0%
School Bus	4	0%	0	0%	2	0%	0	0%	2	0%
Pickup with Camper	3	0%	0	0%	0	0%	0	0%	3	0%
Ambulance	3	0%	0	0%	3	0%	0	0%	0	0%
Other: Carriage/ Plane/Etc.	3	0%	0	0%	0	0%	0	0%	3	0%
Truck & Long Trailer	3	0%	0	0%	1	0%	0	0%	2	0%
Motorhome with Boat or Vehicle in town	3	0%	0	0%	2	0%	0	0%	1	0%
Garbage Truck	3	0%	0	0%	0	0%	1	0%	2	0%
Passenger Car & Boat	2	0%	0	0%	0	0%	0	0%	2	0%
Truck & Mobile Home	2	0%	0	0%	0	0%	0	0%	2	0%
Tractor & 2 Short Trailers	2	0%	0	0%	0	0%	1	0%	1	0%
Commercial Bus	1	0%	0	0%	0	0%	0	0%	1	0%
Farm Equipment	1	0%	0	0%	1	0%	0	0%	0	0%
Tractor & 2 Long Trailers	1	0%	0	0%	0	0%	0	0%	1	0%
Cargo Tank	1	0%	0	0%	0	0%	0	0%	1	0%
Trailer with Vehicle in Tow	1	0%	0	0%	0	0%	0	0%	1	0%
Auto Transporter	1	0%	0	0%	1	0%	0	0%	0	0%
Snow Plow	1	0%	0	0%	0	0%	0	0%	1	0%
Total	**3019**		**63**	**2%**	**609**	**20%**	**360**	**12%**	**1987**	**66%**

Source: HDR, UDOT Office of Traffic and Safety

In other cases, the mix of vehicles on the road can contribute to the number and severity of crashes in an area. U.S. 40 has seen increased truck activity over the course of the study period due to an increase in oil activity in the area. The number of large commercial trucks involved in crashes jumped after 2001 from 4% to 5% and has held steadily around 5% since (Table 11).

Table 11. Trucks as a Percentage of Vehicles in Crashes, 2001–2005

	2001	2002	2003	2004	2005
Number of trucks involved in crashes	22	31	26	33	31
Number of vehicles involved in crashes	555	591	549	643	664
Percent of vehicles which were trucks	4.0%	5.2%	4.7%	5.1%	4.7%

Source: HDR, UDOT Office of Traffic and Safety

Furthermore, as can be seen in Figure 12 through Figure 15, crashes involving large trucks occurred particularly to the east of Duchesne from MP 87 to MP 89 and west of Roosevelt from MP 110 to MP 112; in neither case is there a passing lane for passenger cars to overtake slower truck traffic. Truck crashes were also prevalent in through Vernal’s 35-mph in-town zone (MP 142 to MP 145).

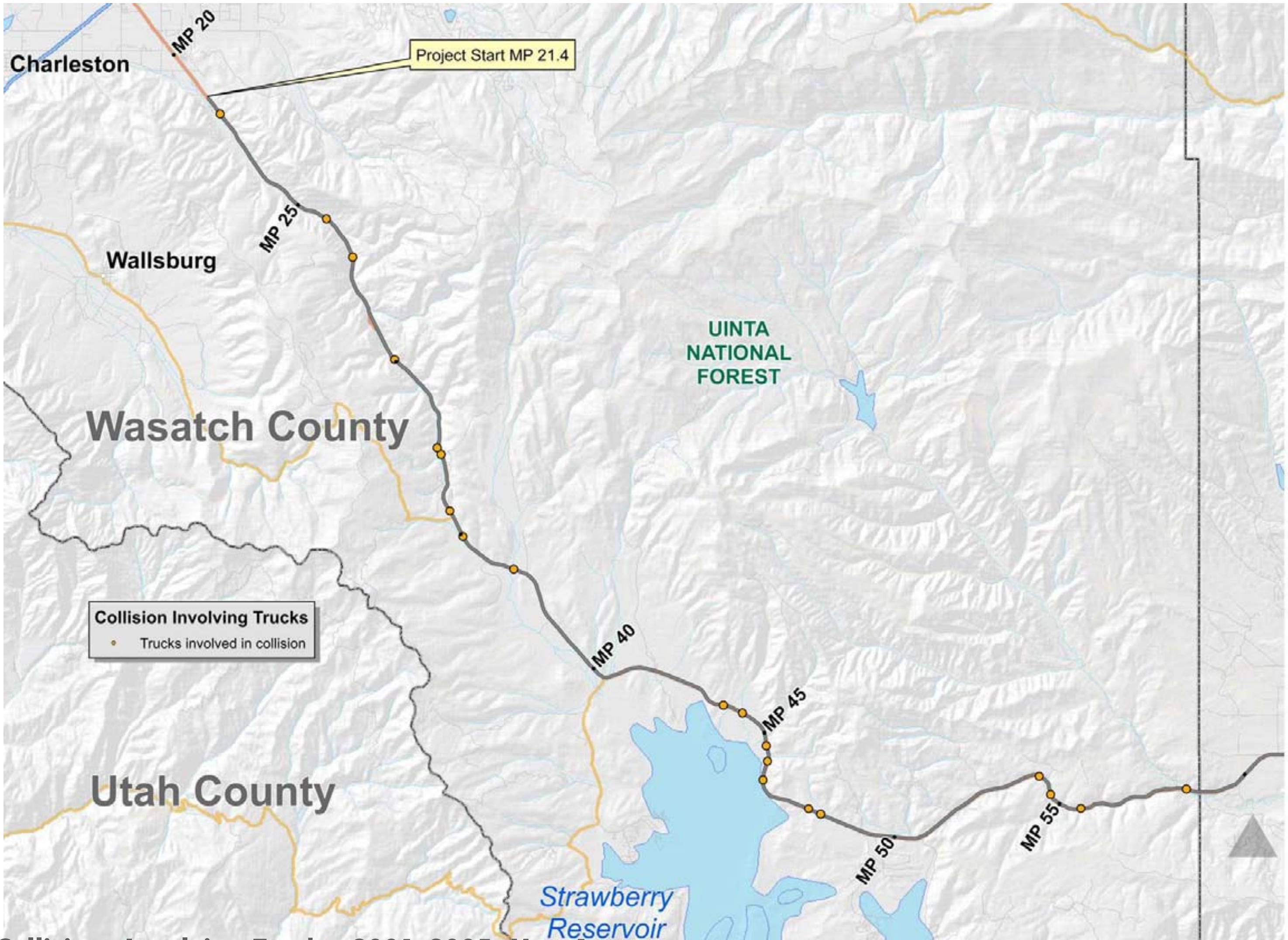

Figure 12. Collisions Involving Trucks, 2001–2005, Map 1

Figure 13. Collisions Involving Trucks, 2001–2005, Map 2

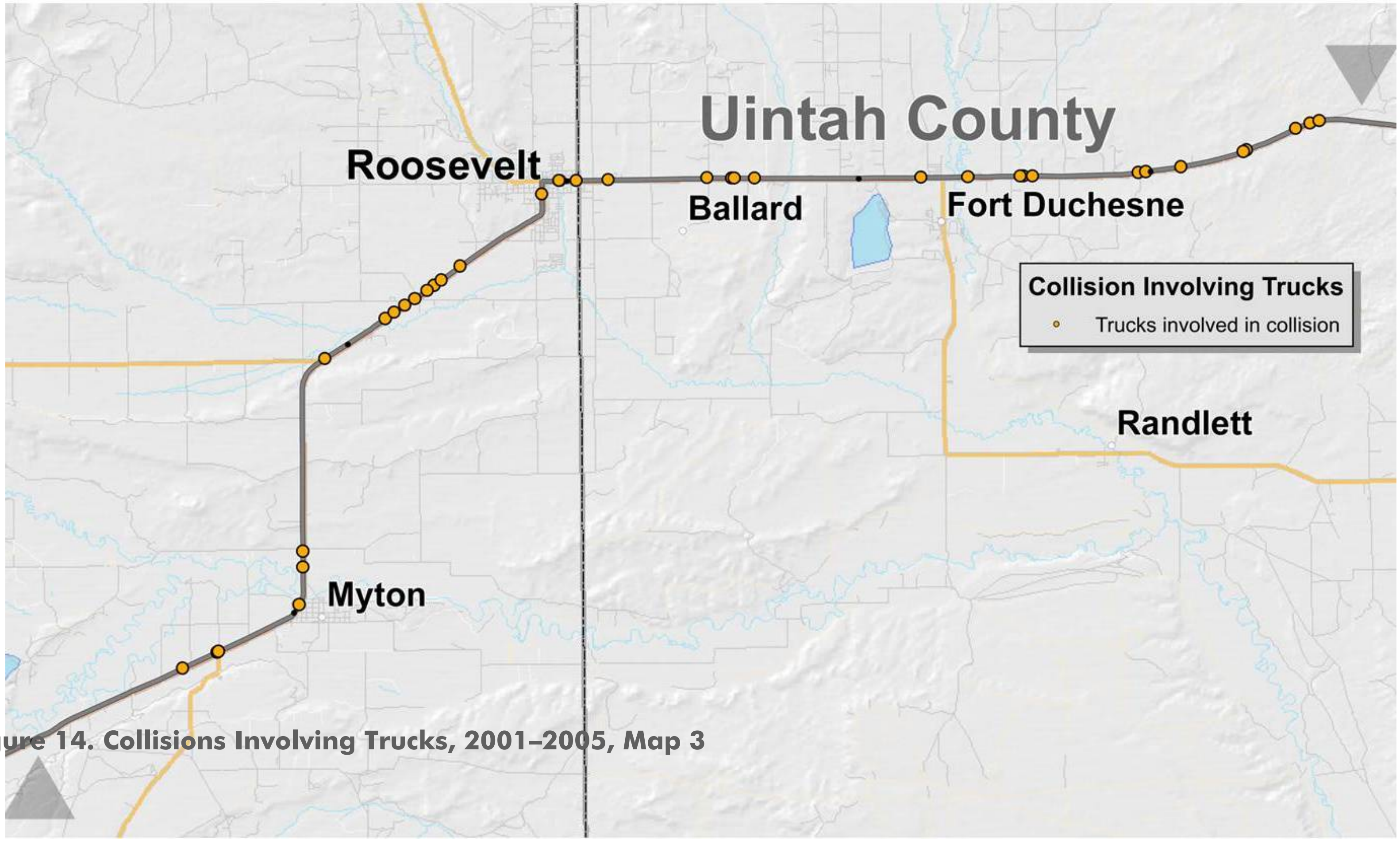

Figure 14. Collisions Involving Trucks, 2001–2005, Map 3

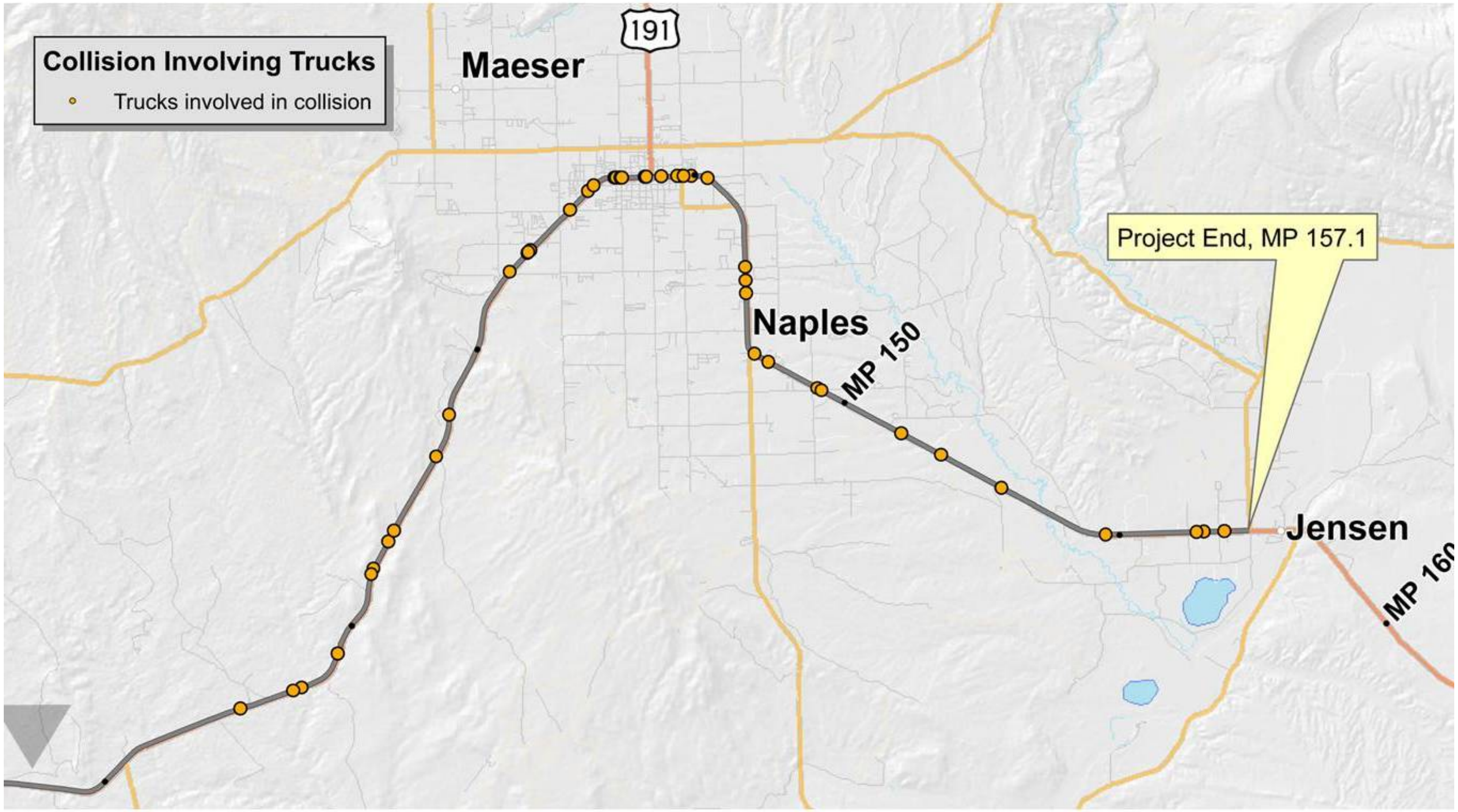

Figure 15. Collisions Involving Trucks, 2001–2005, Map 4

Table 12 summarizes the 5-year crash history by the type of collision that occurred. Most crashes involved a single vehicle; Table 13 shows the causes for those single-vehicle crashes.

Of those crashes involving more than one vehicle, most were rear-end collisions (191). Fatalities resulted primarily from head-on collisions. Of those crashes resulting in evident injury, 11% (40) were caused by collision at a right angle. These data suggest that the nature of the collision, specifically whether it is head-on, determines the likelihood and severity of injury. Special care should be taken to dissuade drivers from passing in risky places or manners. This may warrant more passing lanes in areas that get bottlenecked in heavy traffic.

Table 12. Crash History by Type of Collision, 2001–2005

Type of Collision	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Single Vehicle	1193	58%	6	18%	194	52%	89	42%	904	63%
Rear End	191	9%	1	3%	23	6%	36	17%	131	9%
Right Angle (Straight)	133	6%	3	9%	40	11%	22	10%	68	5%
Head On (Turn Left)	102	5%	5	15%	22	6%	10	5%	65	5%
Right Angle from Right (Turn Left)	90	4%	1	3%	25	7%	22	10%	42	3%
Parked Vehicle	48	2%	2	6%	4	1%	4	2%	38	3%
Rear End (Turn Left Same Direction)	42	2%	1	3%	10	3%	9	4%	22	2%
Side Swipe (Opp Direction)	39	2%	1	3%	13	3%	2	1%	23	2%
Side Swipe (Same Direction)	34	2%	-	-	3	1%	2	1%	29	2%
Head On	28	1%	12	36%	15	4%	-	-	1	0%
Rear End (Turn Right Same Direction)	26	1%	-	-	2	1%	6	3%	18	1%
Same Direction (1 Turn Right)	21	1%	-	-	1	0%	4	2%	16	1%
Right Angle from Right (Turn Right)	19	1%	-	-	6	2%	2	1%	11	1%
Same Direction (1 Turn Left)	18	1%	1	3%	6	2%	-	-	11	1%
Right Angle from Left (Turn Left)	18	1%	-	-	2	1%	-	-	16	1%
Same Direction (2 Turn Right)	14	1%	-	-	1	0%	1	0%	12	1%
U- Turn	11	1%	-	-	2	1%	3	1%	6	0%
Backing	7	0%	-	-	-	-	-	-	7	0%
Right Angle (2 Turn Left)	6	0%	-	-	-	-	1	0%	5	0%
Right Angle from Left (1 Turn Right)	4	0%	-	-	1	0%	-	-	3	0%
Opposite Direction (2 Turn Left)	3	0%	-	-	1	0%	-	-	2	0%
Angle (1 Turn Left, 1 Turn Right)	3	0%	-	-	2	1%	-	-	1	0%
Opposite Direction (1 Turn Left, 1 Turn Right)	2	0%	-	-	-	-	-	-	2	0%
Same Direction (2 Turn Left)	1	0%	-	-	1	0%	-	-	-	-
Same Direction Opposite Turns	1	0%	-	-	-	-	-	-	1	0%
Total	**2054**		**33**	**2%**	**374**		**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Table 13. Single-Vehicle Crash Data, 2001–2005

	Number	% of Single Vehicle Crashes
Wildlife Related	651	54.6
Ran Off Road Right	246	20.6
Ran Off Road Left	124	10.4
Fixed Object	50	4.2
Domestic Animal Related	45	3.8
Other Object Struck	33	2.8
Overturned in Roadway	18	1.5
Bicycle Related	10	0.8
Other Non-Collision	9	0.7
Pedestrian Related	7	0.6
Total	1,193	100.00%

Source: UDOT Office of Traffic and Safety

The following maps, Figure 16 through Figure 19, show the locations of the accidents involving more than the car by collision type for the four most often-reported types: head-on, parked vehicle, rear-end, and right-angle. As can be seen in Figure 18 and Figure 19, these kinds of collisions are more likely to occur in urban areas.

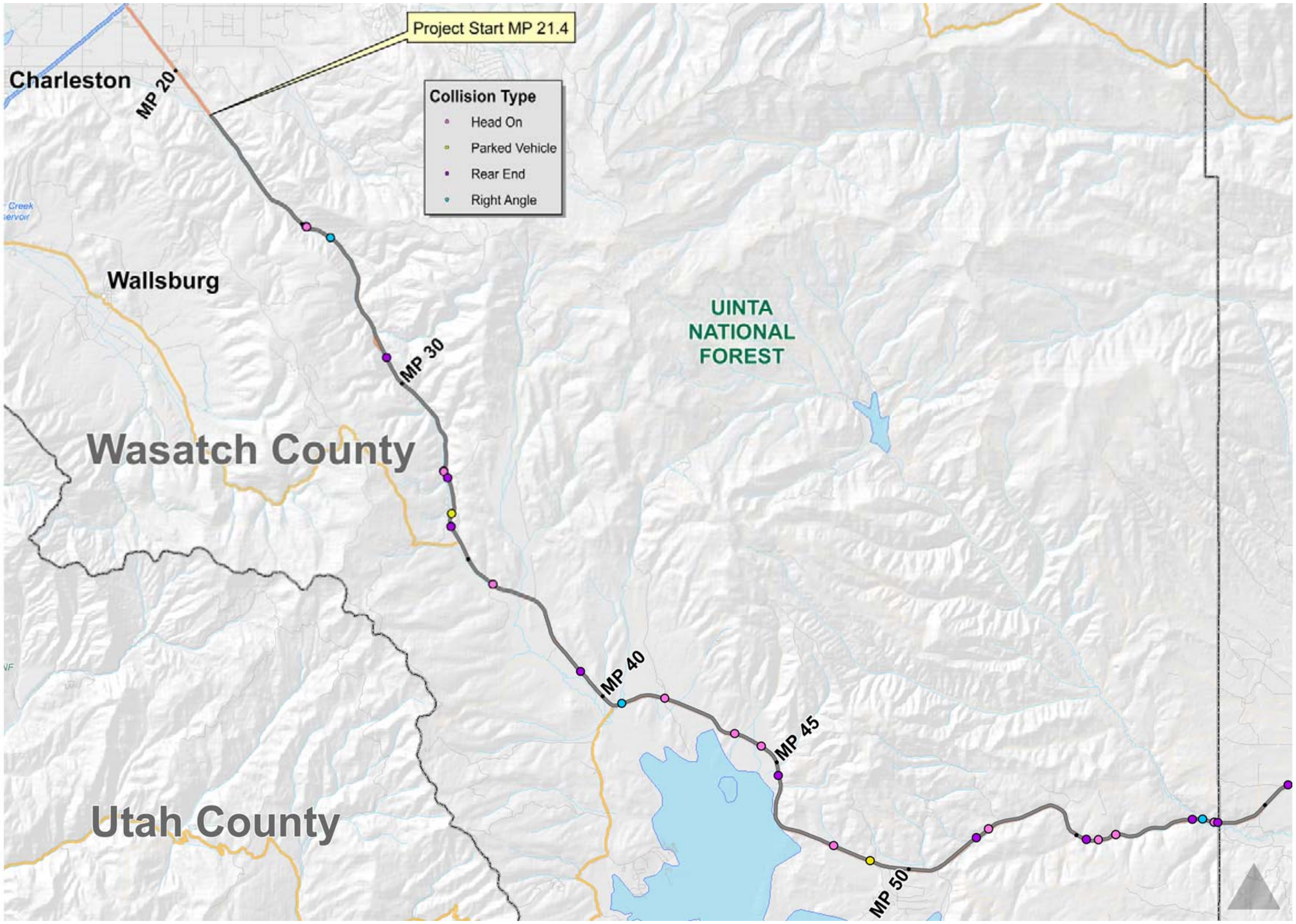

Figure 16. Crashes by Collision Type, 2001–2005, Map 1

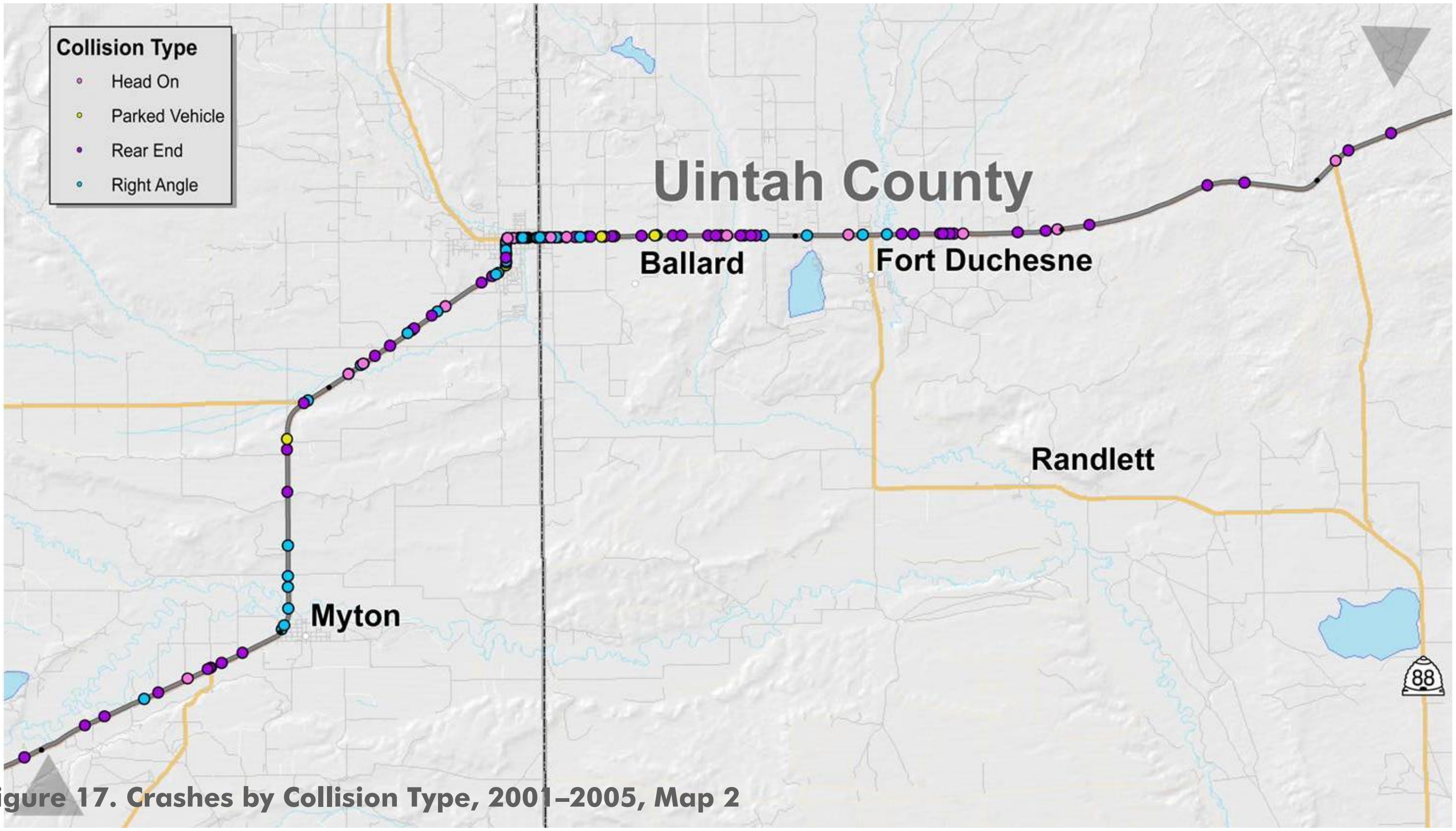

Figure 17. Crashes by Collision Type, 2001–2005, Map 2

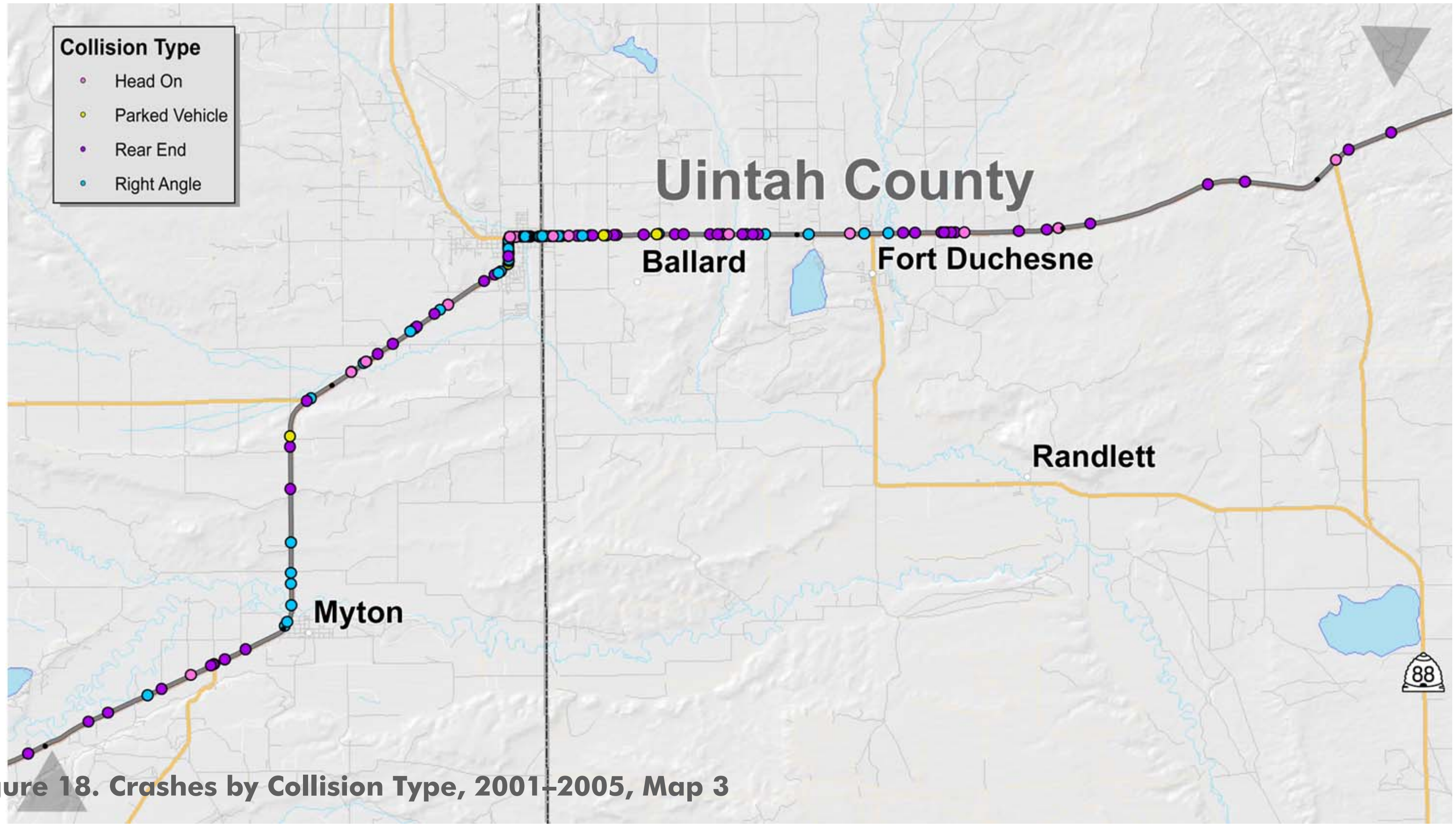

Figure 18. Crashes by Collision Type, 2001–2005, Map 3

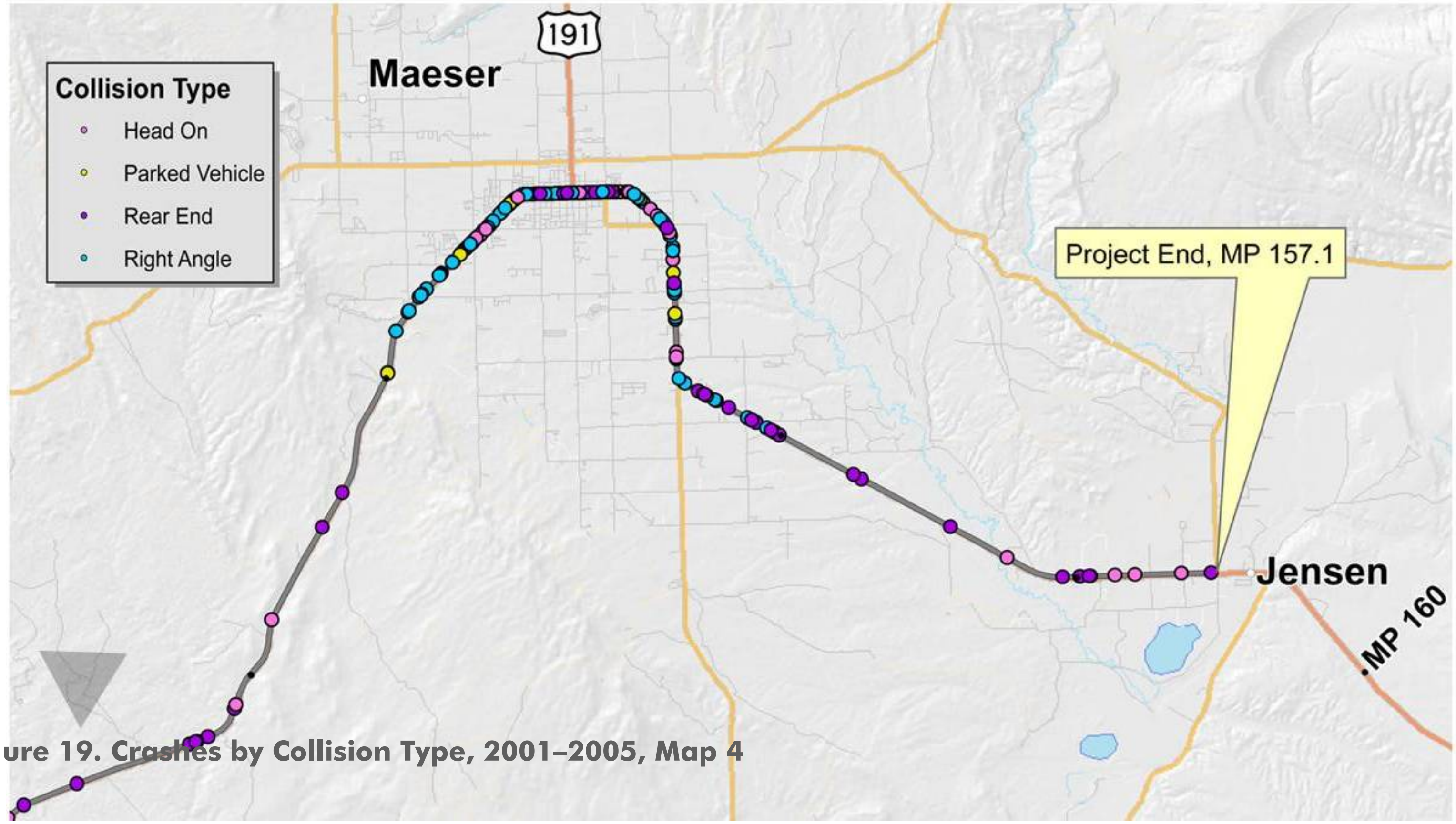

Figure 19. Crashes by Collision Type, 2001–2005, Map 4

Table 15 categorizes the crash data by the type and severity of accident. Of the total number of crashes, 40% involved a moving vehicle (827) and 32% (651) involved a wild animal. A wild animal was the cause of PDO crashes 42% of the time, more than the 36% caused by moving vehicles (511).

After vehicles and wild animals, 22% of possible-injury (48) and 33% of evident-injury accidents (125) resulted from running off the road to the right or left. Twice as many vehicles ran off the road to the right (247) as to the left (123). Running off the road to the right or left caused 18% of fatal crashes (6); 73% (24) involved another moving vehicle.

Table 14. Crash History by Type of Accident, 2001–2005

Type of Accident	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Moving Vehicle	827	40%	24	73%	171	46%	121	57%	511	36%
Wild Animal	651	32%	1	3%	27	7%	25	12%	598	42%
Ran off Road - Right	247	12%	4	12%	83	22%	35	16%	125	9%
Ran off Road - Left	123	6%	2	6%	42	11%	13	6%	66	5%
Fixed Object	50	2%	-	-	4	1%	6	3%	40	3%
Domestic Animal	47	2%	1	3%	8	2%	4	2%	34	2%
Other Non Collision	41	2%	1	3%	10	3%	3	1%	27	2%
Other Object	33	2%	-	-	6	2%	2	1%	25	2%
Overturned	18	1%	-	-	9	2%	3	1%	6	0%
Bicycle	10	0%	-	-	8	2%	1	0%	1	0%
Pedestrian	7	0%	-	-	6	2%	-	-	1	0%
Total	**2054**		**33**	**2%**	**374**	**18%**	**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Figure 20 through Figure 23 map the location of accidents by accident type.

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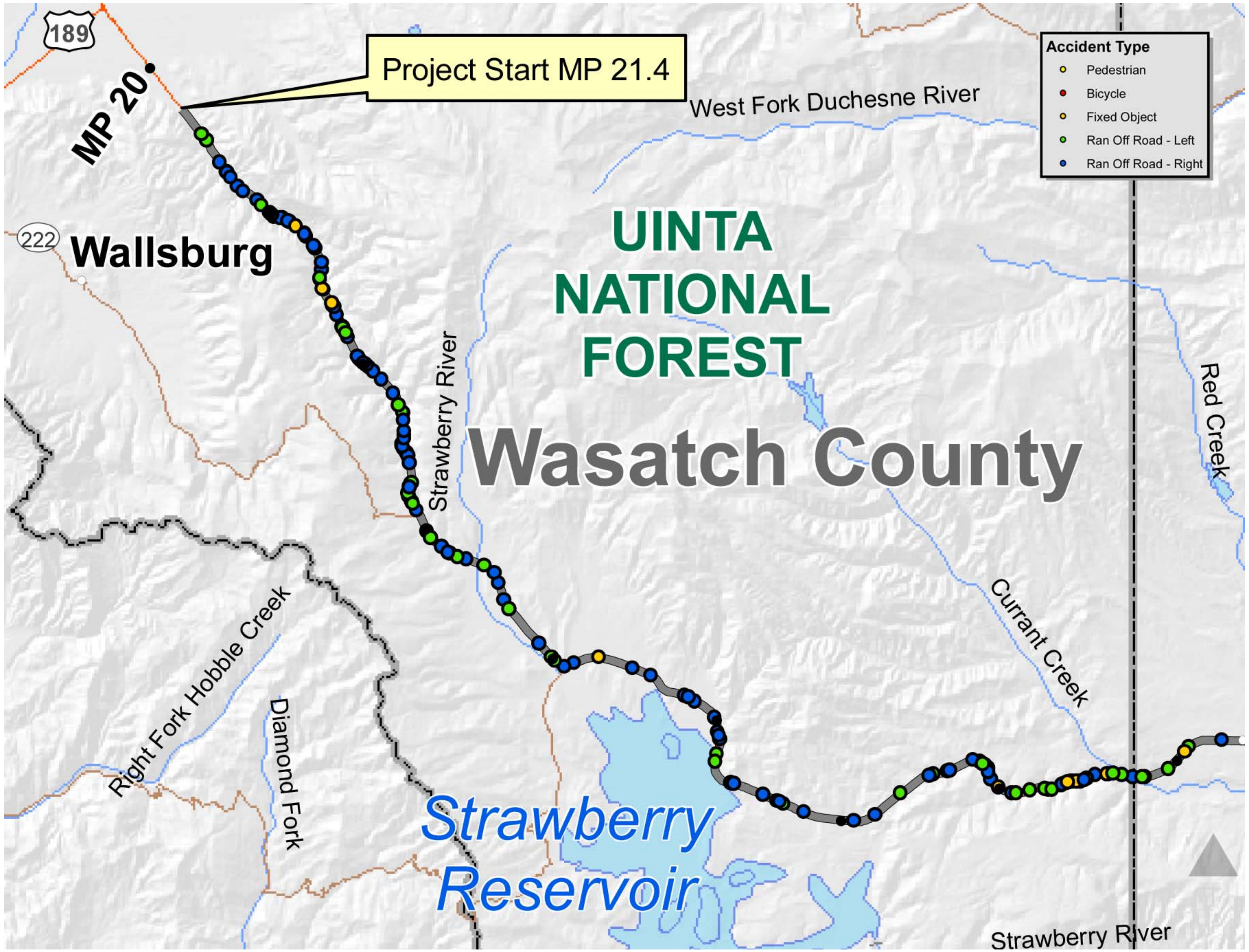

Figure 20. Accident Type, 2001–2005, Map 1.

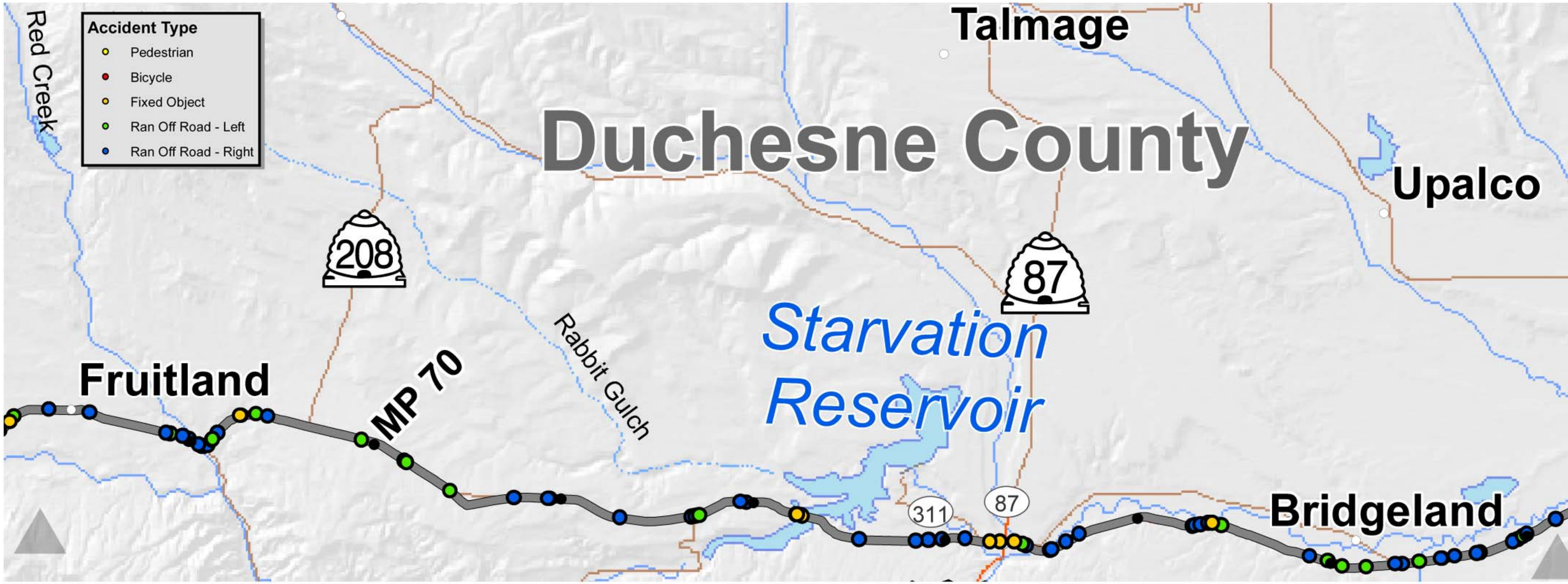

Figure 21. Accident Type, 2001–2005, Map 2.

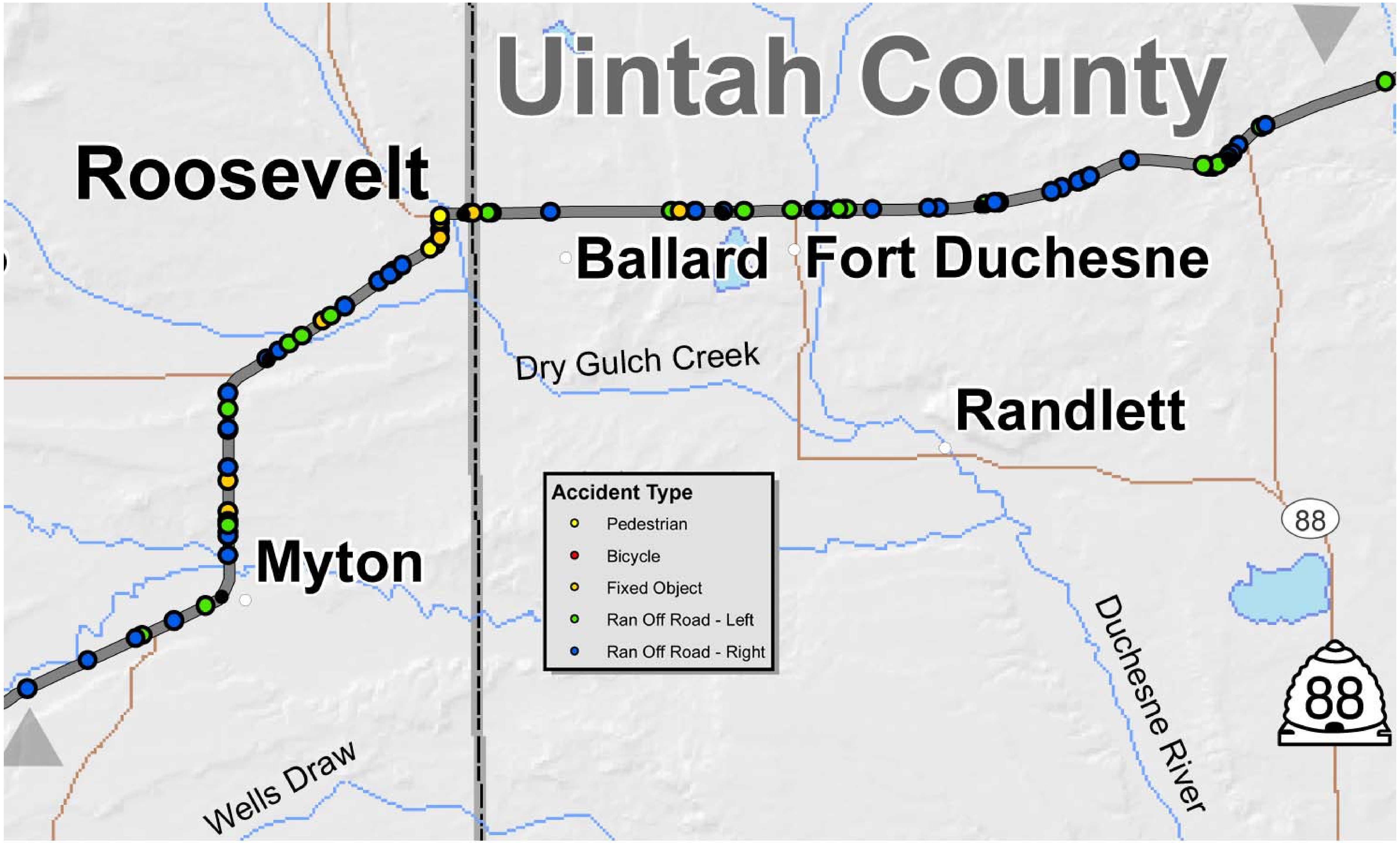

Figure 22. Accident Type, 2001–2005, Map 3.

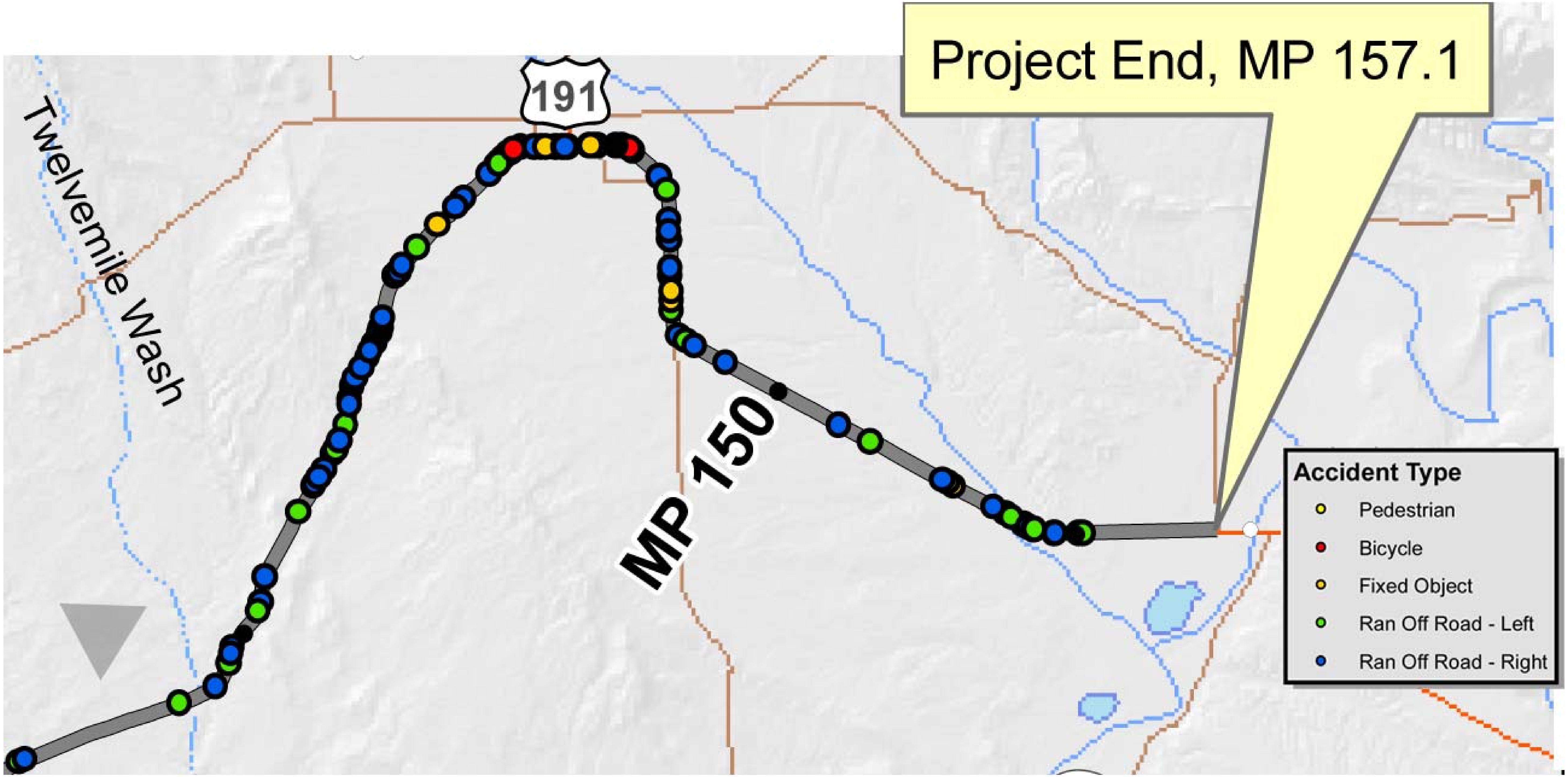

Figure 23. Accident Type, 2001–2005, Map 4.

Generally, many crashes involving wild animals would not be reported, particularly those where no or little damage to the vehicle occurred. Therefore it might be proper to assume that crashes involving wild animals might be more common that what reports indicate.

The following maps indicate the occurrence of accidents involving animals (Figure 24 through Figure 27). Collisions with wild animals are common along the study area, dropping off only from MP 125 to MP 145. Along that 20-mile stretch, 13 crashes involving wild animals were reported from 2001 to 2005, accounting for 2% of all such crashes, and just under 15% of the length of the study area. The rest of the wild-animal-associated crashes are fairly evenly dispersed along the remainder of the corridor at both higher and lower elevations.

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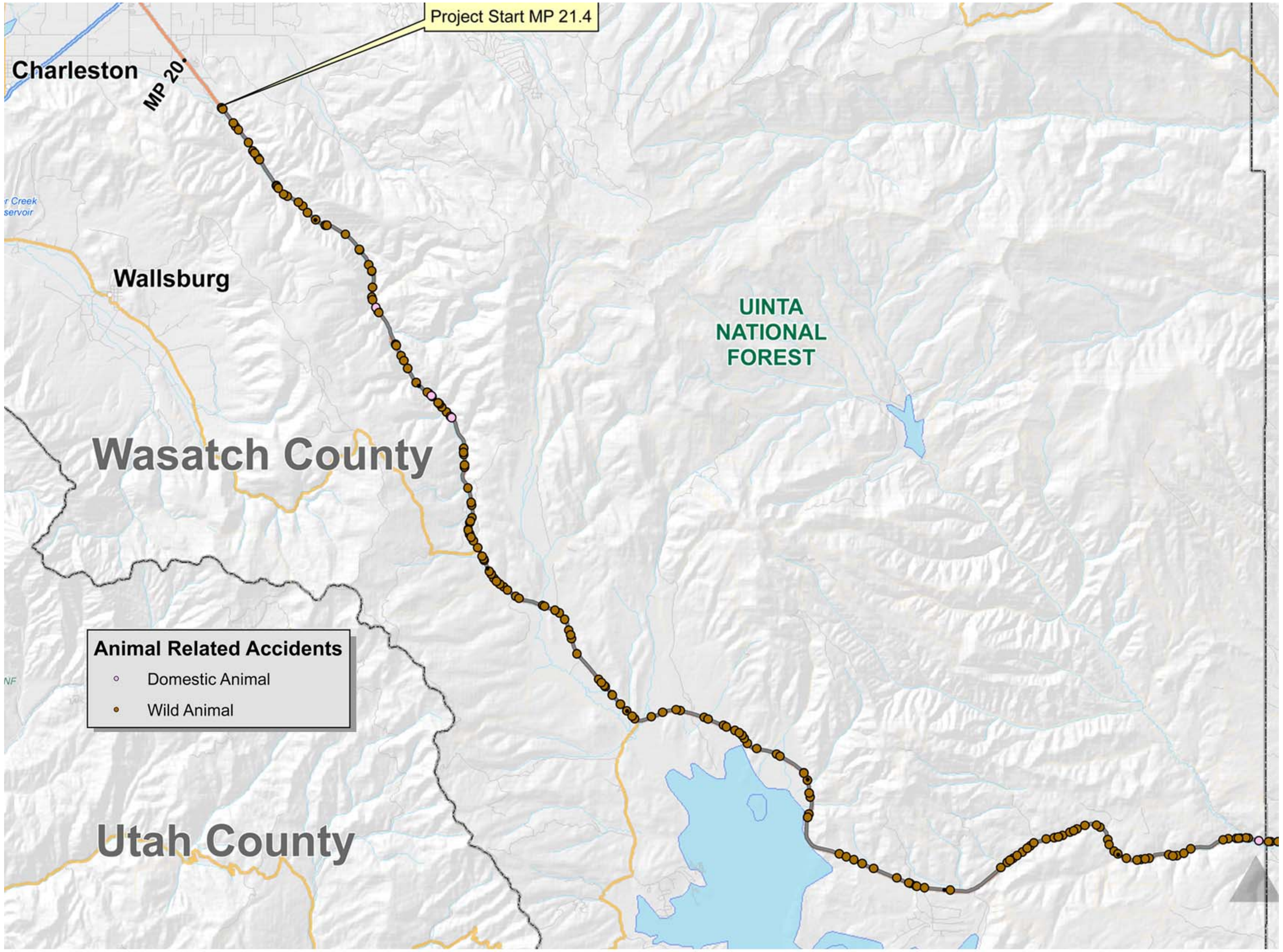


Figure 24. Animal-Related Accidents, 2001–2005, Map 1.

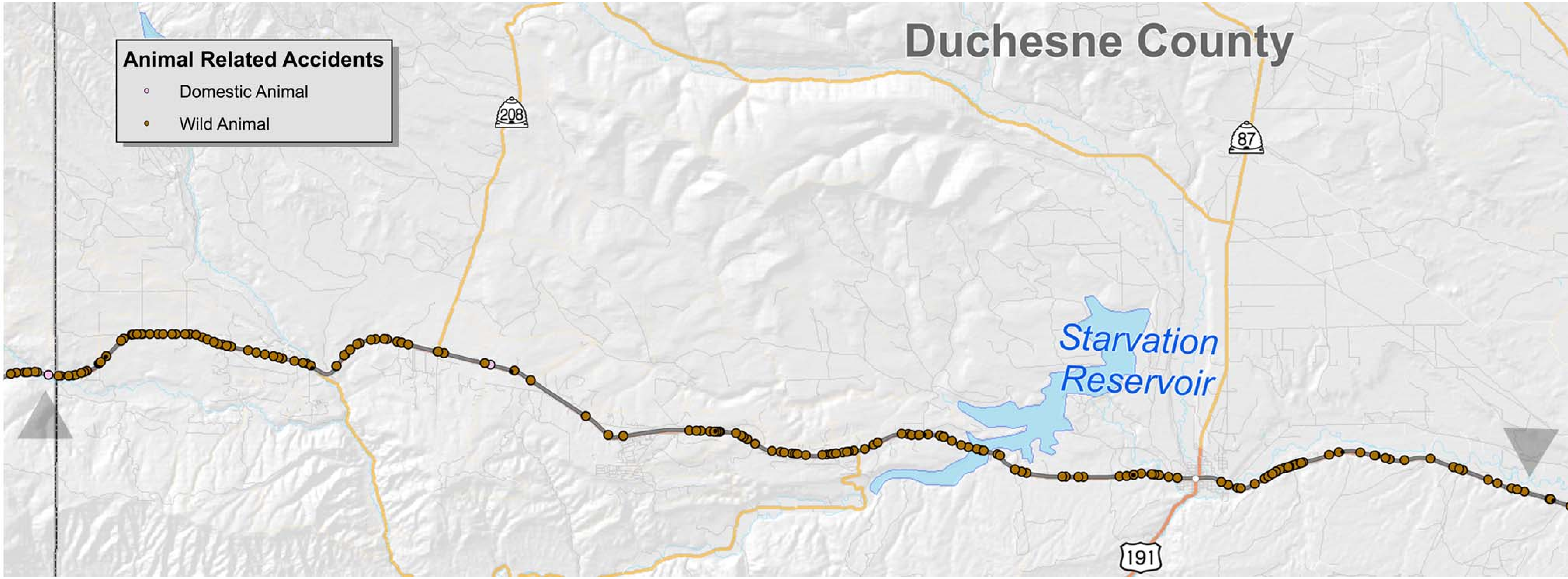


Figure 25. Animal-Related Accidents, 2001–2005, Map 2.

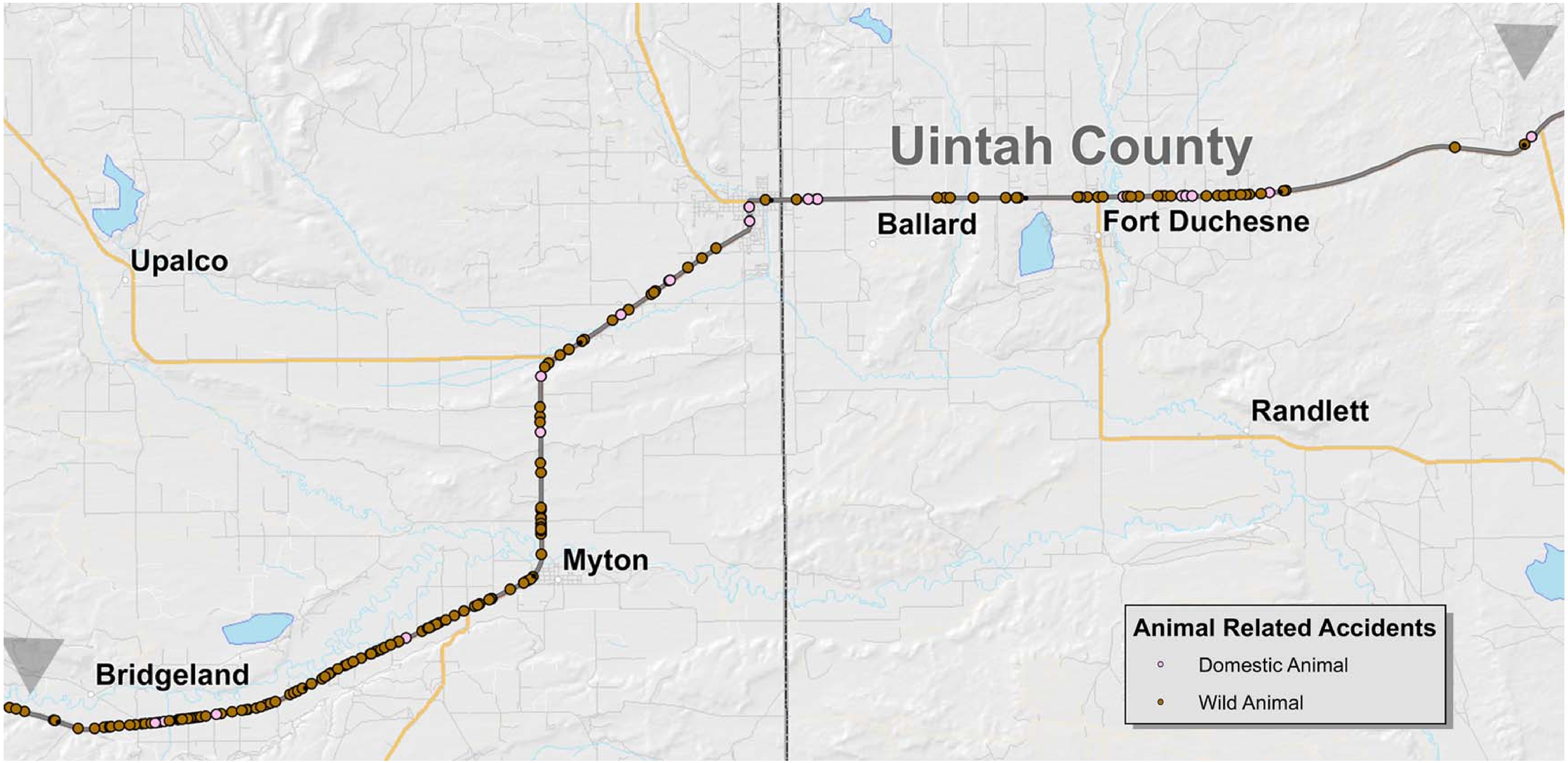


Figure 26. Animal-Related Accidents, 2001–2005, Map 3

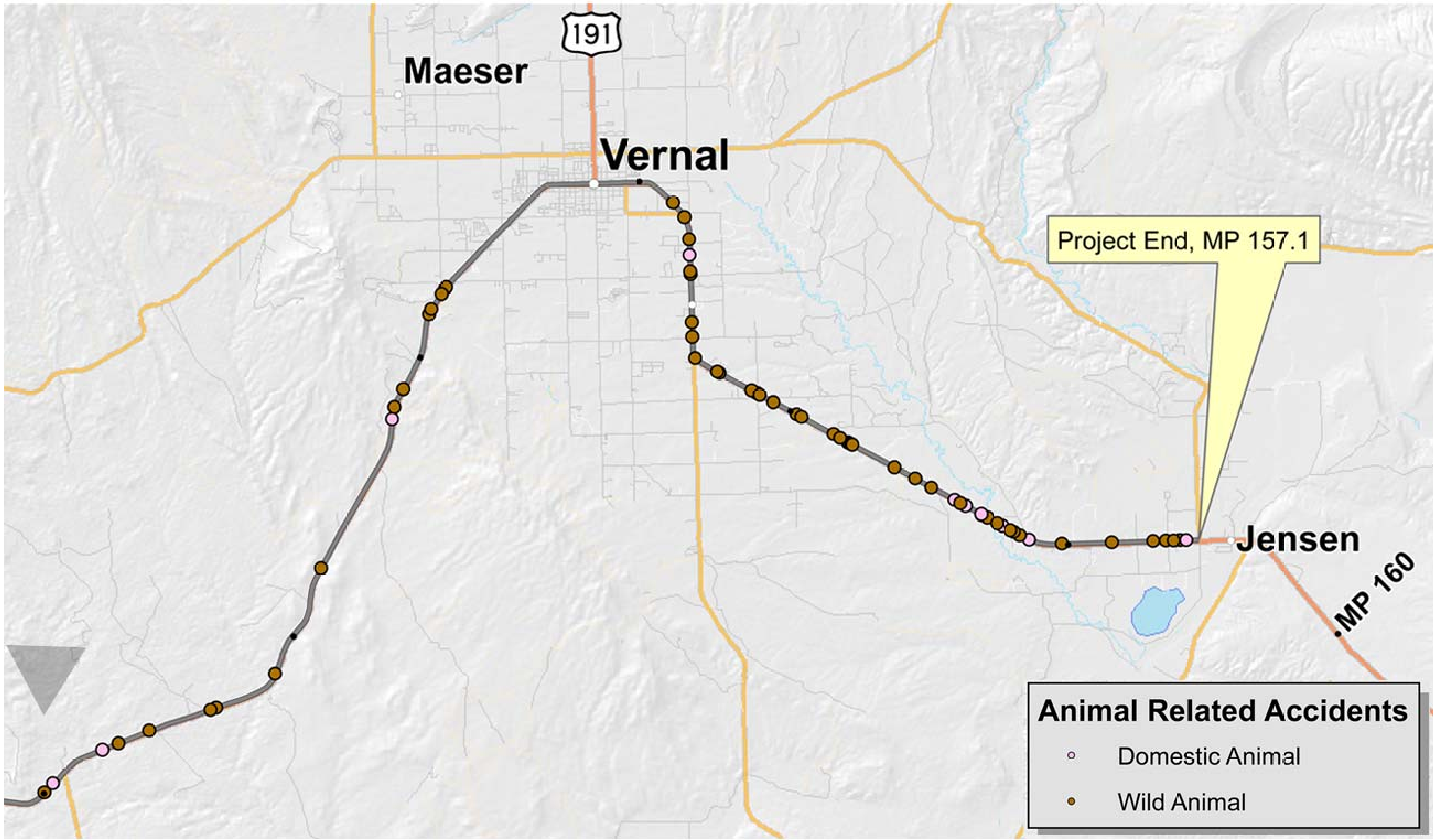
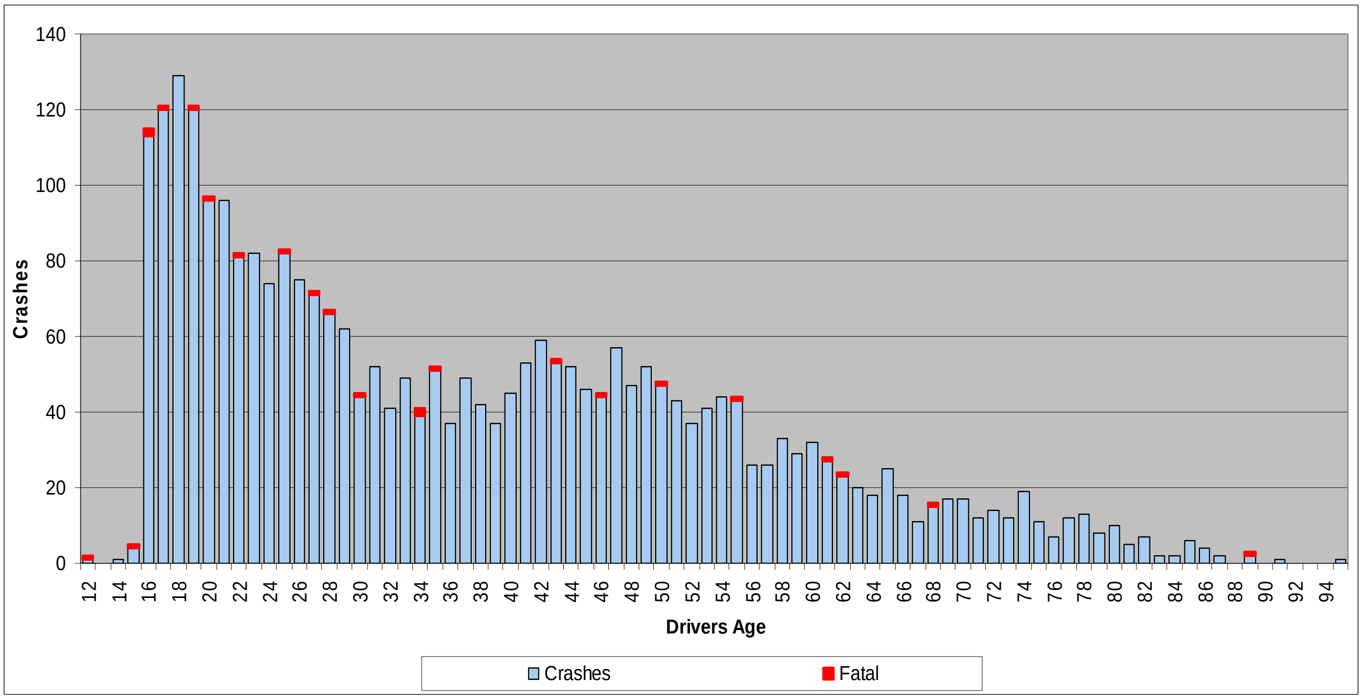


Figure 27. Animal-Related Accidents, 2001–2005, Map 4.

5.1 Drivers and Circumstances

Figure 28 illustrates the crash data by driver age. For the study area overall, younger drivers had more crashes than older ones. Drivers age 16 to 19 had 16% of the crashes on the corridor, while those age 20 to 29 had 26% of crashes. Fatalities followed this broader trend, with 26% of fatal crashes involving drivers under the age of 19 and 22% involving drivers in their 20s.

Figure 28. Crash History by Driver's Age, 2001–2005



Source: HDR, UDOT Office of Traffic and Safety

In many cases, one or more of the vehicles involved in a crash were not considered to be a contributing factor in the crash. This was true for 48% of all vehicles in crashes; 53% of vehicles in PDO crashes, 43% of those in fatal crashes, 40% of those in possible-injury crashes, and 36% of those in evident-injury crashes.

Table 16 lists the contributing circumstances for those vehicles that were judged to have contributed to the crash. Failure to yield right-of-way was cited most often among contributing circumstances, accounting for 16% of all vehicles contributing to an accident (258) and 19% (71) of those contributing to evident-injury crashes. Improper lookout and moving at too fast a speed each accounted for 15% of vehicles contributing to crashes (231 and 229, respectively).

Driving Under the Influence (DUI) was a contributing factor in 50 crashes, or 3% of those for which causes were cited. Approximately 14 of these DUI-related crashes (28%) occurred between MP 108 and MP 116, as U.S. 40 crosses the Uintah and Ouray Reservation, and are concentrated in the town of Roosevelt. This may be due to a liquor store on U.S. 40 at Lagoon Road.

Table 15. Crash History by Contributing Circumstances, 2001–2005

Contributing Circumstance	Contributing Circumstances by Crash Severity									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Speed too Fast	229	8%	6	217%	57	9%	29	8%	137	7%
Failed to yield Right of Way	258	9%	4	244%	71	12%	29	8%	154	8%
Drove Left of Center	26	1%	3	14%	13	2%	1	0%	9	0%
Improper Overtaking	24	1%	2	21%	7	1%	2	1%	13	1%
Passed Stop Sign	8	0%	0	5%	2	0%	3	1%	3	0%
Disregard Traffic Signal	41	1%	0	43%	5	1%	9	3%	27	1%
Followed to Closely	145	5%	3	149%	17	3%	31	9%	94	5%
Made Improper Turn	74	2%	2	75%	16	3%	9	3%	47	2%
Had been Drinking	6	0%	0	5%	2	0%	1	0%	3	0%
Under the influence of Drugs	2	0%	0	0%	1	0%	1	0%	0	0%
Eyesight Defective	1	0%	0	2%	0	0%	0	0%	1	0%
Asleep	68	2%	0	44%	31	5%	9	3%	28	1%
Fatigued	19	1%	2	14%	6	1%	2	1%	9	0%
ILL	4	0%	0	0%	3	0%	1	0%	0	0%
Improper Parking	2	0%	0	3%	0	0%	0	0%	2	0%
Improper Lookout	231	8%	2	241%	43	7%	34	9%	152	8%
Failed to Signal	5	0%	0	6%	1	0%	0	0%	4	0%
Other Improper Driving	67	2%	3	56%	21	3%	8	2%	35	2%
Brakes Defective	9	0%	0	10%	1	0%	2	1%	6	0%
Headlight Insufficient or out	2	0%	0	2%	0	0%	1	0%	1	0%
Headlights Glaring	2	0%	0	2%	1	0%	0	0%	1	0%
Other Lights Defective	7	0%	2	6%	1	0%	0	0%	4	0%
Steering Mechanism Defective	2	0%	0	0%	1	0%	1	0%	0	0%
Tires Defective	11	0%	0	11%	3	0%	1	0%	7	0%
Windshield not Clear	2	0%	0	2%	0	0%	1	0%	1	0%
Other Defective Condition	16	1%	1	0%	2	0%	2	1%	11	1%
Hit & Run	10	0%	0	13%	2	0%	0	0%	8	0%
DUI	50	2%	2	19%	30	5%	6	2%	12	1%
Non-Collision Fire	7	0%	0	11%	0	0%	0	0%	7	0%
Non-Contact Vehicle Involved	9	0%	0	10%	2	0%	1	0%	6	0%
Jackknife	1	0%	0	0%	0	0%	1	0%	0	0%
Cargo Loss or Shifted	24	1%	0	30%	3	0%	2	1%	19	1%
Explosion of Fire	1	0%	0	2%	0	0%	0	0%	1	0%
Separation of Units	5	0%	0	6%	1	0%	0	0%	4	0%
Wrong Side of Road	8	0%	1	3%	5	1%	0	0%	2	0%
Improper Backing	8	0%	0	13%	0	0%	0	0%	8	0%
Towed Vehicle	8	0%	0	10%	1	0%	1	0%	6	0%
Rolling Vehicle in Traffic Lane	2	0%	0	3%	0	0%	0	0%	2	0%
Driver Using Cell Phone	1	0%	0	2%	0	0%	0	0%	1	0%
Other Driver Distraction	18	1%	0	6%	11	2%	3	1%	4	0%
Object in Roadway	26	1%	1	29%	5	1%	2	1%	18	1%
Aggressive Driving	6	0%	1	2%	2	0%	2	1%	1	0%
99	60	2%	0	56%	14	2%	11	3%	35	2%
U	2	0%	0	2%	1	0%	0	0%	1	0%
(blank)	72	2%	1	84%	10	2%	8	2%	53	3%
total	**1579**		**36**	**2%**	**392**	**25%**	**214**	**14%**	**937**	**59%**

Source: HDR; UDOT Office of Traffic and Safety

6.0 General Recommendations

UDOT should explore ways to effectively deter animal collisions; this may include animal-detection systems linked to variable message signs, fencing, or reduced speed limits during certain hours of operation or during certain seasons.

With the increasing truck activity on the corridor, crash rates and severity should be monitored to ensure safe operating conditions into the future.

UDOT should explore policy development to effectively reduce the high involvement in crashes of young drivers. Young drivers tend to perceive less risk associated with traffic hazards and to overestimate their ability to control a vehicle under emergency conditions. To them, driving is about rights but not about obligations. A pilot program could be initiated by UDOT within Region 3 to create a task force with local young victims and/or crash victims' parents. This group could conduct meetings and workshops at high schools to provide a direct and vivid experience of the obligations and risks involved in driving.

APPENDIX A:

Oil & Gas Truck Traffic Impacts on U.S. 40 Corridor, Utah

Oil & Gas Truck Traffic Impacts on U.S. 40 Corridor, Utah

in support of the
U.S. 40 Corridor Study

MP 21 in Wasatch County to MP 157 in Uintah County, Utah

Utah Department of Transportation

Project No. S-0040 (85) 21

Prepared by
HDR Engineering, Inc.
3995 South 700 East, Suite 100
Salt Lake City, UT 84107

July 2007

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1.0 Oil and Gas Industry Associated Truck Traffic and its Impact on the U.S. 40 Corridor in Utah

1.1 Introduction

Higher prices for raw and refined products in recent years have prompted the oil and gas industries to increase exploration and drilling. Particular emphasis in oil and gas exploration has been occurring domestically in states like Utah. According to the Utah Geological Survey, the number of oil and gas drilling permits in Utah reached 2,062 in 2006, over 6 times the number from 1999 (Utah Geological Survey 2006). Given that the Uintah Basin is Utah's largest and most productive oil and gas development area, the increase of activity related to this industry has primarily affected the basin (Kuhn 2006).

The increased oil and gas activity in the Uintah Basin has instigated an increase in truck traffic along the area's primary highway, U.S. Highway 40 (U.S. 40). Consequently, increased truck volumes have changed traffic conditions along the highway in Utah, especially between milepost (MP) 21 in Wasatch County and MP 157 in Uintah County, which has been the target area for drilling and exploration of oil and gas along the highway.

Changing traffic conditions have diminished the operation of this section of highway, particularly as related to increased truck traffic. These increased volumes have prompted capacity issues due mostly to geographical features of the roadway; increased safety concerns; and degraded highway surface conditions throughout the region. These resulting issues initiated an investigation focused on identifying the specific causes of the problems and on determining mitigation measures that will address the operational and safety challenges associated with the increased truck traffic.

This report focuses on the following:

- **The state of the oil and gas industries in the Uintah Basin :** the state of natural gas, oil, and tar sand mining
- **The relationship between oil and gas and trucking in the Uintah Basin:** how the drilling of oil and gas in the basin relies upon heavy trucks, how oil and gas associated trucks can disrupt the traffic on U.S. 40, and what forecasted truck traffic levels mean to the future of the highway

- **Recommendations and conclusions:** recommendations for improvements that can be made to U.S. 40 in order to enhance traffic safety and promote traffic movement along this route

2.0 The State of Oil and Gas Industries in the Uintah Basin

2.1 Natural Gas Industry

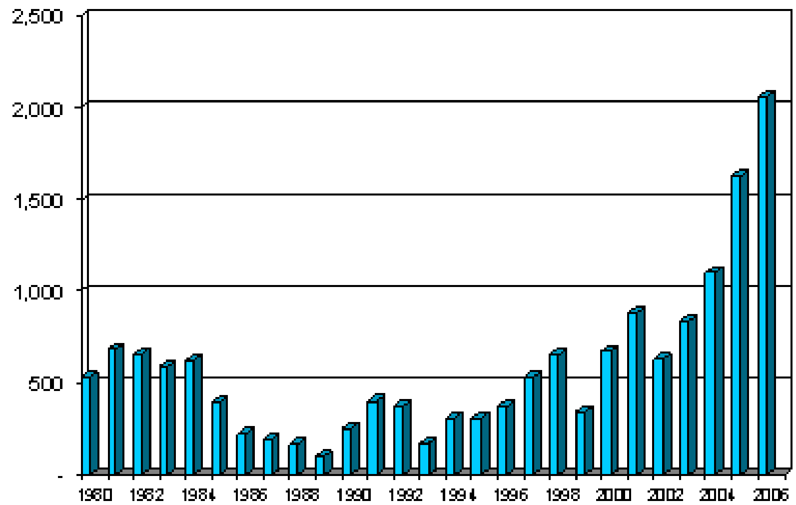
Historical evidence suggests that the market for crude oil has been of a boom-and-bust nature. This is especially true domestically, where voluminous pockets for this resource exist less frequently. Because there are so few areas that contain a large quantity of crude oil, drilling is often concentrated in specific locations that are known or suspected to contain the resource. Oftentimes such intense activity results in an expenditure of funds and then exploration abandonment. For this reason, sourcing natural gas can be more attractive to the energy industry.

The market for natural gas differs from that for oil in several ways. First, shipping gas overseas is difficult, which makes the market for natural gas almost entirely domestic. Thus, the market for natural gas may be considered more stable than oil's global market.

Second, the current market for natural gas is large and demand for this resource is high. The natural gas that is being drilled in Utah is sold for immediate use within a year.

At this time, most of the drilling permits issued by the Bureau of Land Management (BLM) in Utah are for natural gas wells. Figure 2-1 represents the applications for permits to drill in Utah between the years of 1980 and 2006. New natural gas well production primarily affects the area on the east end of the U.S. 40 study corridor, between Roosevelt and Jensen.

Figure 2-1 Utah Applications for Permit to Drill by Year, 1980-2006



Source: The Utah Division of Oil, Gas, and Mining

2.2 Oil Industry

While the market for oil has been volatile in the past, current demand has pushed the price of crude to a point that makes inland drilling speculation feasible. In interviews with oil and gas representatives (Bower 2007; Dean 2007; Moon 2007; Taylor 2007), those involved in the industry expect crude oil production will stay on pace for the next 20 years, limited only by the ability to ship crude oil to refineries or create refining capacity in specific areas. This prediction is backed up by the introduction of financial investment from outside resources (Taylor 2007).

Refining in the Uintah Basin is currently not available, and crude is transported to Wyoming or Salt Lake City for processing. Demand and high prices have oil producers in the basin looking to increase refining capacity by 40,000 to 60,000 barrels a day in Salt Lake City or the basin itself. Uintah and Ouray Reservation representatives are looking into refining on the reservation, as this location would allow immediate access to crude from the basin.

Increased refining capacity could be important to the oil industry in the Uintah Basin as the refineries in Salt Lake City are currently operating at high capacity. The Utah Geological Survey reports that Utah refineries received record amounts of crude oil in 2006, with 20.2% coming from Canada (Utah Division of Oil, Gas, and Mining 2007). Imported crude oil to Utah refineries can pose tight competition for the already slim refining capacity provided for local companies.

The oil extracted from the Uintah Basin must be trucked from the field to a refinery. This mode of transport becomes more expensive the further a refinery is from the field. Consequently, refineries that exist at greater distances from the drilling site make operations less profitable and the development of local refining capacity more attractive.

2.3 Tar Sand Mining

The tar sand deposits within the Uintah Basin have been identified as a prime mining region; there are more petroleum based tar sands between Vernal and Rock Springs, Wyoming, than in Saudi Arabia. With tar sand deposits, mining produces crude oil, asphalt and frac sand (an essential ingredient to the drilling process where it is used to break apart rock strata holding oil and gas reserves). According to a representative of Temple Mountain Energy (TME), the process used to extract the tar sand will enable the local TME mine to be profitable even when crude oil is selling for as little as thirty dollars a barrel (Bower 2007).

Asphalt and frac sand could be very marketable resources for the future of industry in this region. While frac sand is currently trucked in from out-of-state, the development of the proposed TME Mine may create a local source of frac sand for regional drilling operations.

These tar sand reserves, like those of shale oil, could become a reliable asset for crude oil in the future. For extraction of these reserves to be cost-effective, however, oil and gas companies operating in the region may need to finance a science and technological movement to refine oil from these sources at an increased cost-effective capacity. Local companies will also need to facilitate the improvement of the area's infrastructure to enhance convenient transport to the nearest refinery.

To service the oil industry, trucks move crude oil out of the basin for refining then deliver end products, like gasoline and diesel, back into the area. Local refining would allow some of these "full circle" trips to be cut, potentially reducing the number of trucks on the roads.

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3.0 Relationship between Oil and Gas Development and Trucking in the Uintah Basin

3.1 Pipelines

In many oil-producing areas, pipelines are used to move crude oil from the drill site to the refinery. As there is no pipeline available to oil companies in the Uintah Basin, producers must move crude oil to the refinery by truck. Even so, investments in a pipeline would not remove a notable portion of the trucks from U.S. 40 for the following reasons:

- The nature of the crude oil pumped from this area is a very waxy substance that is full of paraffin. Thus, the oil does not flow easily through a pipeline.
- Natural gas is currently piped to Salt Lake City, and construction of a proposed north-south pipeline that would connect with the existing east-west pipeline would allow easy transport to many other areas of the country. This north-south pipeline connection may decrease a fraction of the trucks utilizing U.S. 40, but nearly all of the crude oil trucks will continue traveling on this stretch of U.S. 40.
- Removing the “supertankers” (very large trucks having seven or more axles and two trailers) associated with the transport of crude oil would only slightly decrease truck traffic, as supertankers make up less than 5% of the trucks associated with the oil and gas industries.

3.2 Truck Traffic and New Well Construction

Most truck traffic that occurs in association with the oil and gas industries is tied to the production of new wells. While natural gas wells may be productive for twenty to twenty five years, 50% of their output comes from their first year of operation.

When prices are high for natural gas, the reward for moving quickly to open new wells can increase substantially. As a result, there is high demand for trucks to aid in the distribution of construction equipment to the well site, delivery of the drilling rig, removal of waste produced from the digging the well, and production of the final product.

Over the long term, trucks are needed to haul away the water removed during pumping. This is especially true for gas wells, which produce high amounts of water both during the initial drilling process and over the life of the well.

In his report, *Highway Freight Traffic Associated with the Development of Oil and Gas Wells* (2006), Daniel B. Kuhn of the Utah Department of Transportation (UDOT) estimates that new construction requires between 365 and 1,730 large truck trips per well to travel to and from the site. This estimate assumes that:

- The construction equipment will range from 10 to 15 truckloads for a shallow well (5,000 to 12,000 feet deep) to 45 truckloads for deep wells (15,000 to 20,000 feet deep)
- Bringing in the drilling rig to the site will take 30 truckloads

Digging the drill well will require:

- 25 truckloads to fill the water storage ponds and 100 to 1,000 loads of fresh water to aid in the drilling process, depending on the depth of the well
- 50 to 100 truckloads of waste removal
- 10 to 20 truckloads of drilling fluid for breaking up rock strata during well digging
- Up to 10 truckloads of well casing brought in to line the inside of the well
- 2 to 5 truckloads of cement and 2 to 4 truckloads of fly ash for well construction

And to operate the well:

- Replacement of drilling machinery will require another 10 truckloads of equipment
- The removal of the drilling rig, once the well is complete, will again take 30 truckloads
- 1 or 2 truckloads will be needed to complete the well for production
- The completion rig to prepare the well for production will take 130 to 135 truckloads of equipment, and the removal of the rig will take 20 to 25
- 3 to 5 truckloads will be needed to close the reserve pits
- 10 to 12 truckloads of machinery will be needed to run the facility

Overall, average daily truck trips associated with well production can account for approximately 8,000 trucks per day along this section of U.S. 40.

3.3 Current Truck Traffic on U.S. 40

One supertanker holds 280 barrels of oil. In the Uintah Basin, enough crude oil is shipped each day to send 117 supertanker loads to refineries. Fully loaded, each supertanker weighs between 124,000 and 128,000 pounds. So, while they make up a small portion of the total trucking associated with the oil and gas industry, supertankers represent a major obstacle for the average motorist, especially on hills and in no-passing zones.

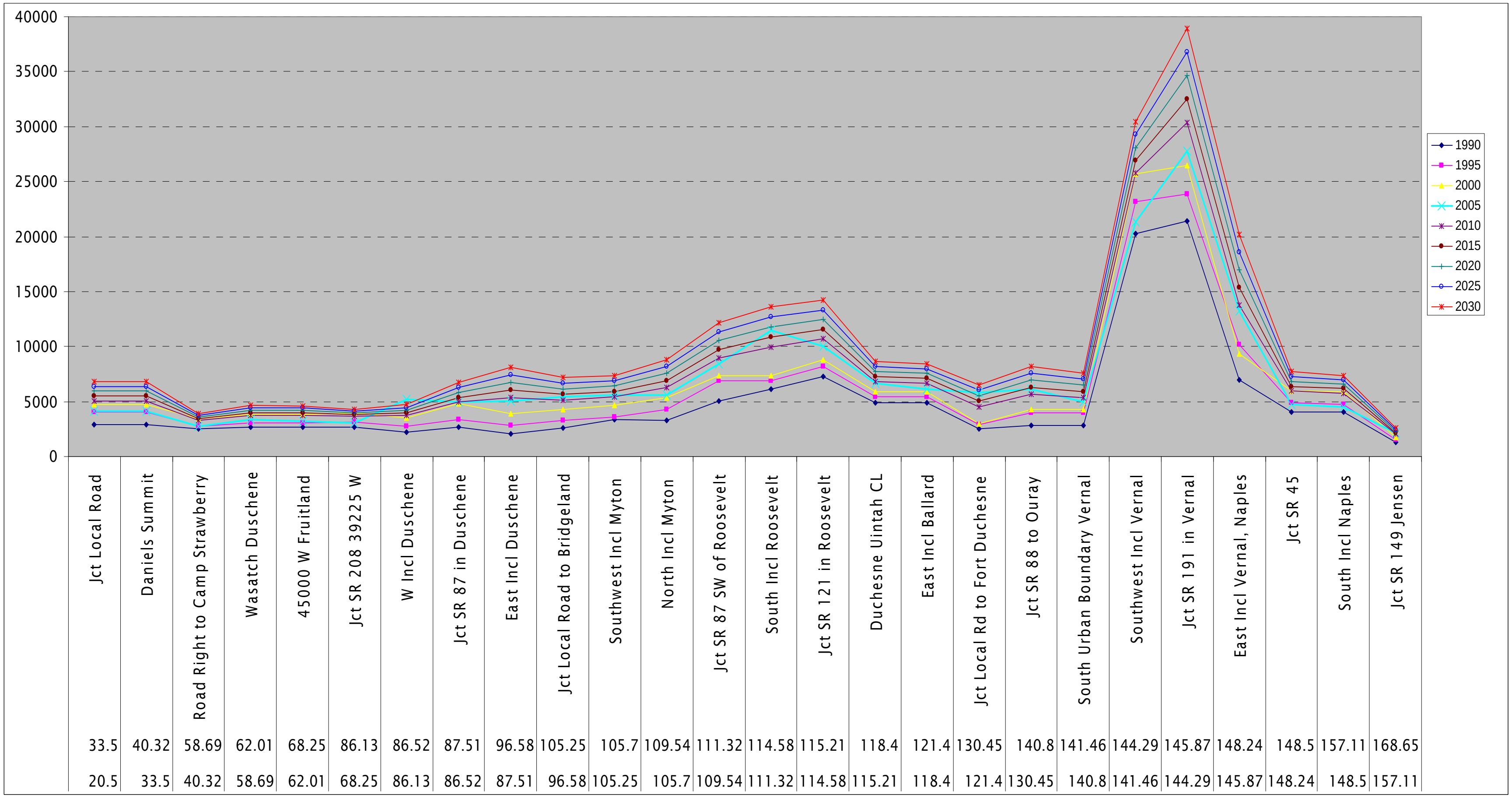
The topography of the U.S. 40 corridor is such that hills are frequent. Steep grades slow down heavy trucks and the traffic behind them, and there is often no passing lane that enables lighter vehicles to overtake the trucks safely.

In some cases, steep grades combine with trucks entering the flow of traffic, causing major bottlenecks. This is the case at the intersection of U.S. 40 and State Route (SR) 88, at which traffic traveling at 65 mph is interrupted by trucks entering the highway up a steep grade. Heavy trucks attempting to get up to speed while climbing a hill may move so slowly that they surprise passenger car traffic and cause hard braking.

3.4 Forecasted Traffic on U.S. 40

Traffic volumes on U.S. 40 are anticipated to increase by an estimated rate of approximately 1.2% over the next twenty years. This rate is based on average historic traffic growth between the years of 1986 and 2005. Figure 3-1 represents anticipated growth for the comprehensive section of U.S.40 studied in the report.

Figure 3-1. Anticipated 2005-2030 Traffic Growth Along the U.S. 40 Project Corridor



Average daily truck traffic volumes on U.S. 40 were obtained from the UDOT website. Based on the published 2005 truck volumes for the 136-mile ling project corridor, an estimated average of 33% of the traffic volume is made up of heavy trucks. It is likely that truck volumes have increased since this time, and it can be projected that truck volumes may reach up to 50% of the total traffic on U.S. 40 in the foreseeable future.

3.5 Long Term Implications for U.S. 40

Based on the abovementioned dynamics for the future of U.S. 40, several implications can be predicted. The following summarizes the primary truck traffic-related concerns and challenges for the future of U.S. 40:

- Traffic volumes are likely to increase on U.S. 40, with equipment bearing truck traffic comprising a large percentage of these volumes.
- Increased truck volumes on U.S. 40 may increase safety concerns on sections of the road, especially at steep grades and urban intersections.
- Increased truck volumes on U.S. 40 are likely to cause accelerated roadway wear and tear.
- A pipeline to transport crude oil out of this area is highly unlikely due to the waxy consistency and sluggish pipeline movement of crude oil from this region. If alternative transport for crude oil is not feasible, crude bearing trucks are likely to continue using U.S. 40 in the foreseeable future.

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4.0 Recommendations and Conclusions

The following recommendations are largely based on the information and the findings contained in this report. Interviews with key stakeholders (Bower 2007; Dean 2007; Moon 2007; Taylor 2007) provided crucial knowledge to the research process. Previous recommendations from Daniel B. Kuhn’s 2006 report helped to identify additional issues of concern. Lastly, current and forecasted average daily traffic volumes on U.S. 40 were vital to understanding service levels on specific segments of road. These factors aided in the formulation of the following recommendations and conclusions.

4.1 Previous Recommendations

In his report, *Highway Freight Traffic Associated with the Development of Oil and Gas Wells* (2006), Kuhn predicts that truck traffic levels will continue to increase over the next five years in the Uintah Basin. This increase prompted Kuhn to make the following suggestions for improvements to U.S. 40, in order of importance:

1. **Improve junctions where state or country roads handling high numbers of oil and gas-related traffic intersect with U.S. 40:** This would consist of traffic signals in some cases and improved turn pockets and accelerating/decelerating lanes in all cases. The intersections of U.S. 40 and SR 88 between Roosevelt and Vernal, as well as the intersection of U.S. 40 and Pleasant Valley Road west of Myton, are most in need of the aforementioned improvements.
2. **Add passing lanes and passing lanes of adequate length:** This is primarily an issue on U.S. 40 in the inner-basin corridor between Duchesne and Naples, although downhill passing lanes in Daniels Canyon were given high priority. This need also extends to state truck routes that feed energy-related truck and auto traffic into U.S. 40.
3. **Provide full-width shoulders or more frequent safety pullouts:** This is also primarily an issue between Duchesne and Naples, with the Duchesne to Myton and Gusher to Vernal segments of the corridor identified as the route segments with the greatest need.

4.2 Pipeline and Rail Line Recommendations

A pipeline may be one cost-effective solution to the transport of natural gas out of the Uintah Basin. The waxy nature of Utah's crude oil may make pipeline transport impractical, but rail provides a method of transportation for crude oil that does not share many of the problems of trucking on narrow, two lane roads. At this time, some materials coming in to the basin are sent via rail to Craig, Colorado, and then trucked the remainder of the way to the Uintah Basin. There is a proposal to extend rail access from the Craig terminus to a new, local station. The refinery currently under consideration for the Uintah and Ouray Reservation is waiting on the construction of this rail extension as a pivotal element in establishing capacity in the basin.

4.3 Roadway Recommendations

4.3.1 Four Lane Roads

Beyond the need for passing lanes, the forecasted traffic between Duchesne and Vernal warrants an additional through lane in each direction. The study corridor to the west of Duchesne has enough truck traffic that more passing lanes should be provided, but the population of that area is low enough that it does not require a second lane.

4.3.2 Passing Lanes

One significant issue that should be addressed throughout the corridor is passing lanes that are too short to realistically allow a car to get around a truck, some of which stop abruptly at the top of hills. These lanes need to be lengthened so that passenger cars do not get caught at the end of the passing lane unaware.

4.3.3 Access Control

Automobile transportation routes must balance the demand for through traffic flow with that needed for local access. For a highway such as U.S. 40, multiple access points from rural roads, private roads, and driveways can slow traffic considerably. Improved access control such as shared access points and frontage roads would minimize the interruptions caused by traffic entering and exiting the highway. To allow for smooth travel along U.S. 40, particularly given that it is a two-lane highway, access should be restricted or consolidated where possible.

4.3.4 Concrete Intersections

Asphalt is a suitable material for highways, especially in areas that get very cold, where concrete can become very slippery. In the heat, however, asphalt can turn soft. In many urban areas along the corridor, the asphalt is rutted from the heavy stops and starts of trucks at intersections. In these areas, converting the intersections to concrete is advised. Trucks pulling heavy loads would start against a firmer surface, allowing them to get up to speed more quickly, and the road would suffer less damage as a result.

4.3.5 Bypasses/Truck Routes

Truck traffic causes many problems when it is routed through the heart of urban areas. Beyond the safety issues that arise when large trucks are combined with pedestrian and bicycle traffic, there is the detrimental effect that truck noise and fumes have on the quality of life in these areas.

Such is the case in Vernal, where congestion begins as truck traffic on U.S. 40 enters town, causing congestion and brake odor. At this point, the widening of the road to two lanes in each direction may represent the first chance a motorist has to pass since Roosevelt. If drivers seize this opportunity, they are likely not slowing for in-town traffic.

For this reasons, the residents of Vernal may benefit from a truck route that takes heavy vehicles around the community and other pass-through vehicles may benefit from a quicker trip, unimpeded by traffic and signals. A potential bypass roadway is currently being studies in Vernal by the Uintah Basin Transportation Special Services District and is thus not part of the U.S. 40 Corridor Study.

Truck travel through urbanized areas such as Vernal can present challenges for other reasons. The intersections in small towns and cities may be are narrow, making it difficult for trucks to turn while staying in the designated lane. This situation is a particular concern at the intersection of U.S. 191 in Vernal and at the intersection of SR 89 in the city of Duchesne. The combination of intersection configuration and increased speeds needed to overcome truck traffic in urban areas can amplify concerns. This situation is likely to cause increased congestion for all motorists along the targeted sections of U.S. 40 and result in safety concerns.

Further investigation can help identify alternate routes for truck traffic to bypass specific urban areas. Identifying an alternate truck route for key urban areas along U.S. 40 can decrease the need to expand internal community roads and intersections. Decreasing the need for infrastructural roadway improvements inside townships can potentially decrease urban air pollution, prevent direct impacts to existing homes and businesses, inhibit impacts on historic buildings, and reduce problems associated with traffic congestion.

4.4 Conclusions

4.4.1 Recommendations for Immediate Implementation

- Add passing lanes between Vernal and Roosevelt
- Improve the intersections at U.S. 40/SR 88 west of Duchesne and U.S. 40/Pleasant Valley Road near Myton

4.4.2 Recommendations for the Short Term (over the next 1-5 years)

- Widen the highway between Vernal and Roosevelt to four lanes
- Investigate alternative alignment around the town of Gusher, so that the necessary right-of-way may be purchased and preserved
- Add passing lanes between Roosevelt and Duchesne
- Add concrete intersections in the corridor between Vernal to Naples
- Lengthen passing lanes over hillcrests along entire corridor
- Construct an interchange at the intersection of SR 88 and U.S. 40

4.4.3 Recommendations for the Mid-term (5-15 years)

- Widen the highway from Roosevelt to Duchesne to four lanes
- Add westbound passing lanes in Daniels Canyon
- Construct concrete intersections between Duchesne and Roosevelt

4.4.4 Recommendations for the Long Term (after 15 years)

- Widen the highway between Heber City and Duchesne
- Convert major intersections to interchanges at:
  - Pleasant Valley Road near Myton
  - U.S. 191 in Vernal
  - SR 87 in Duchesne
  - Ioka Junction near Myton
- Widen shoulders to 10 feet throughout corridor

- Build bypass routes around communities

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